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Environmental Assessment

Deep Creek Watershed Restoration

Paulina Ranger District, Ochoco National Forest
Crook and Wheeler County, Oregon

T. 13 S., R. 22 E., Sections 11, 13, 14, 23-26, 35, 36

T. 13 S., R. 23 E., Sections 7-36

T. 13 S., R. 24 E., Sections 18, 19, 29-32

T. 14 S., R. 22 E., Sections 1, 2, 11-14, 23-27, 35, 36

T. 14 S., R. 23 E., Sections 1-36

T. 14 S., R. 24 E., Sections 5-8, 16-18, 19-21, 28-32

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Introduction

The Paulina Ranger District of the Ochoco National Forest, Oregon proposes to improve watershed health by restoring and managing highly impacted streams. This action is needed because many streams in the watershed exhibit high width to depth ratios or entrenched traits. Historically, these streams were narrower and deeper with quality pool habitat for fisheries. These degraded aquatic habitats have and continue to contribute to the decline of redband trout populations and water quality. Stream restoration treatments have been analyzed within the Deep Creek Watershed**.**

Alternative 2 (Proposed Action) would:
- Improve watershed health by restoring and managing highly impacted streams.
- Restore streams to a more desired pattern, profile, and dimension.
- Improve aquatic habitats to support redband trout populations.

In addition to the proposed action, the Forest Service also evaluated the following alternatives:
- Alternative 1 (No Action): No stream restoration activities would occur. Presently occurring management activities would continue as allowed.
- Alternative 3: This action alternative is similar to Alternative 2 (Proposed Action) but with a subset of Alternative 2 proposed activities plus additional projects.

Alternative 2 (Proposed Action) and Alternative 3 focus on the need for restoration or repairs because of degraded site conditions, primarily the loss of riparian vegetation and increased rates of soil erosion and sediment yield. Activities would be expected to have a short-term (less than two years) increase in soil erosion and sediment yield from work occurring near or in the active stream courses, associated soil disturbance, and loss of ground vegetative cover. Long-term benefits of decreased soil erosion, sediment yield, stream temperatures, and improved fisheries habitat have the potential to outweigh short-term increases in soil erosion and sediment yield.

Based upon the effects of the alternatives and public input, the responsible official (Paulina District Ranger) will decide whether or not to initiate culvert replacements, headcut and cutbank stabilizations, large wood placement, channel reconstructions, riparian improvement fencing, off-channel water developments, and road closures. All activities with the exception of some road closures would occur within Riparian Habitat Conservation Areas (RHCAs) and would be designed to move towards compliance with interim Riparian Management Objectives (RMOs).

Chapter 1

Document Structure

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four chapters:

Chapter 1

- *Introduction:* This section includes information on the history of the project area, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.

Chapter 2

- *Comparison of Alternatives, including the proposed action:* This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on issues raised by the public and other agencies. This discussion also includes possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.

Chapter 3

- *Affected Environment and Environmental Consequences:* This section describes the existing condition of each resource and the environmental effects of the proposed action and other alternatives. This analysis is organized first by issue, then by alternative. Within each section, the affected environment is described first, followed by the effects of the No Action that provides a baseline for evaluation and comparison of the other alternatives that follow.

Chapter 4

- *Compliance with Existing Forest Plans, Regulations, and Policies of other Jurisdictions, including Local Comprehensive Plans:* This section describes compliance/noncompliance with other laws and policies.
- *Agencies and Persons Consulted:* This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
- *Glossary:* A list of definitions of acronyms, abbreviations, and terms used.
- *Bibliography:* A list of references cited within the document.
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Paulina Ranger District Office in Paulina, Oregon.

Background

The Deep Creek Watershed drains approximately 55,368 acres of the south slope of the Ochoco Mountains, is located in the Upper Crooked River sub-basin, and is within the larger Deschutes River Basin (Figure 1, page 5). Streams within the watershed include: Deep Creek, Little Summit Creek, Crazy Creek, Happy Camp Creek, Jackson Creek, Double Corral Creek, Derr Creek, Thornton Creek and other named and unnamed tributaries. Deep Creek empties into the North Fork Crooked River, which was designated Wild and Scenic in 1988. Elevations range from approximately 4,500 feet to 6,315.

A wide variety of soils and landtypes are contained within the watershed. Parent materials are comprised primarily of lava flows. Volcanic ash from Mt. Mazama (Crater Lake) covered the area approximately 6,600 years ago. Newberry Crater ash has also been deposited over much of the area. Ash soils occur over 30% (16,600 acres) of this watershed.

During the past century use of forestlands within the Deep Creek Watershed (watershed) has contributed to a decline in stream health. Past and present activities within this watershed has included timber harvest, domestic livestock grazing, big game management, recreation, fire suppression, and road construction. These activities have resulted in conditions that contribute to continuing soil erosion, changes in stream channel pattern, profile, and dimension, and have contributed to a decline in water quality and fish habitat. Increased sediment yields and stream temperatures, reductions in pool habitat, and reduced upstream accessibility have reduced quality fisheries habitat.

Many stream channels have widened and deepened within the flood plain, effectively lowering the water table and reducing the amount of area available to support riparian vegetation. Riparian vegetation traps sediment and stabilizes stream banks, reducing erosion and sediment yield. The lowering of the water table allows soils to dry out, leading to a shift in vegetation composition from deeply rooted riparian species to shallow rooted less desirable ones (Whisenant, S.G.1999). Fire suppression activities have led to the encroachment of conifers in the riparian areas, replacing desirable riparian plant species that provide soil protection with less desirable shallow rooted species; streambanks are exposed to erosion with the loss of soil holding root masses from willows, sedges, and rushes.

Many roads, permanent and temporary, alter stream drainage patterns by confining the stream, reducing the area within the floodplain, and disturbing floodplain interaction. This in turn affects riparian habitat and its function and may increase the erosion rate and sediment yield delivered to the stream (Soils report, Deep Vegetation Management Environmental Impact Statement, 2004).

Beginning in the 1880s and continuing until 1906 when this land was withdrawn for Forest Reserves, unrestricted livestock grazing occurred. These grazing practices contributed to soil compaction, loss of effective groundcover, head cutting, post holing, and puddling. Much of the productive riparian soils have been lost, changing the character, structure, and productivity of riparian zones and stream courses. A large amount of sediment has moved and continues to move from these areas. Nonnative grasses and forbs species dominate many of these areas, invading disturbed sites when the less resilient native plant species decline under grazing pressure. Since the regulation of livestock grazing, many of the riparian and stream channel conditions have shown improvement (Soils report, Deep WA).

Since 1990 stream restoration activities have occurred within the planning area. These restoration

activities include: culvert replacements, riparian planting, road closures, instream large wood placement, headcut restoration, spring development, and construction of livestock exclosure fences. Headcut restoration has occurred in Happy Camp Creek, Timothy Meadow, and Derr Creek and has stopped the advancement of these headcuts providing some local reduction in erosion rates and sediment yield. Spring development projects have and will likely continue to occur within the planning area. The development of Double Corral Spring (Derr Allotment) was an attempt to draw cattle away from riparian areas and improve livestock distribution to maintain or improve effective ground cover.

The Deep Creek Watershed has been analyzed within this Environmental Assessment to identify and prioritize specific areas across the landscape that have been impacted by human, animal, and natural disturbance activities, altering watershed function.

Purpose and Need for Action

The purpose of this action is to implement the goals and objectives for water described on pages 4-35 to 4-36 of the Forest Plan. Specifically the purpose of this action is to improve overall stream and riparian health and integrity within the watershed and improve water quality and associated habitat suitable for use by redband trout and other aquatic life. The needs for the proposed action are derived from the differences between current conditions and desired conditions. Desired conditions are based on Forest Plan direction and management objectives.

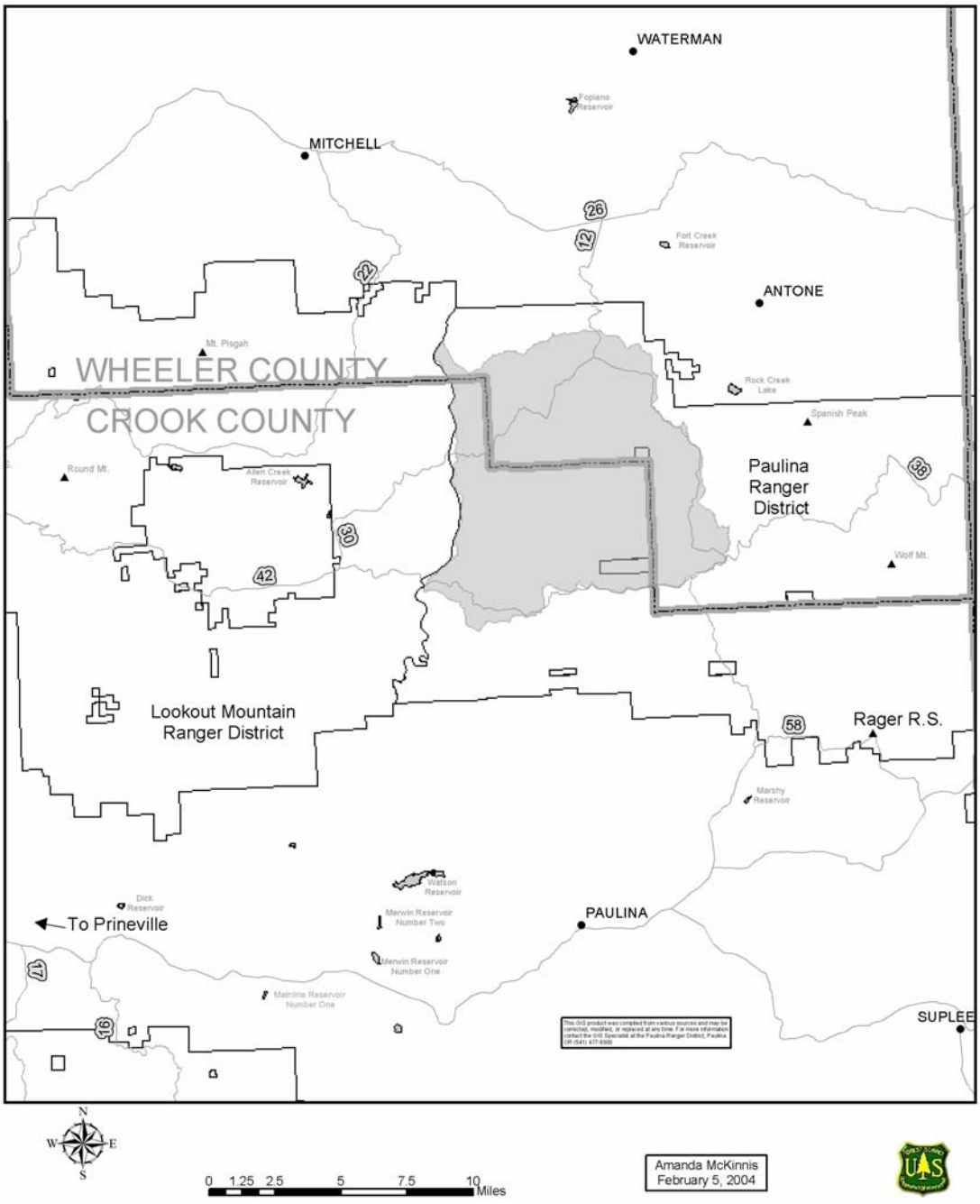
There is a need to:

- Stabilize stream head cutting and stream banks to improve and maintain channel stability
- Remove and/or replace culverts to allow adequate access for fish
- Allow identified riparian areas to recover natural vegetation
- Provide better distribution of livestock
- Improve instream fish habitat
- Decrease stream sedimentation

Additionally this action is needed to comply with the riparian goals of the Inland Native Fish Strategy (INFISH, 1995) to maintain or restore water quality to a degree that provides for stable and productive riparian and aquatic ecosystems; maintain or restore stream channel integrity, channel processes, and the sediment regime; and maintain or restore instream flows to support healthy riparian and aquatic habitats and route flood discharges.

Proposed actions also respond to the goals of the Deep Water Quality Restoration Plan (WQRP, 2001), pages 27-28) to 1) reduce stream temperatures on 303(d) Listed streams, 2) maintain and improve Riparian Habitat Conservation Areas (RHCAs) so that streams approach their maximum site-potential vegetation and shade 3) improve aquatic habitat potential and bank stabilization through recovery of riparian vegetation and placement of large wood and 4) restore channel form and flow regime to mitigate elevated stream temperatures and degraded habitat (WQRP The prioritization of proposed projects are in conformity with those outlined in the Deep Creek Watershed Analysis (pages 75-78, 1999).

Figure 1 – Vicinity Map for the Deep Creek Restoration Project, Paulina Ranger District.

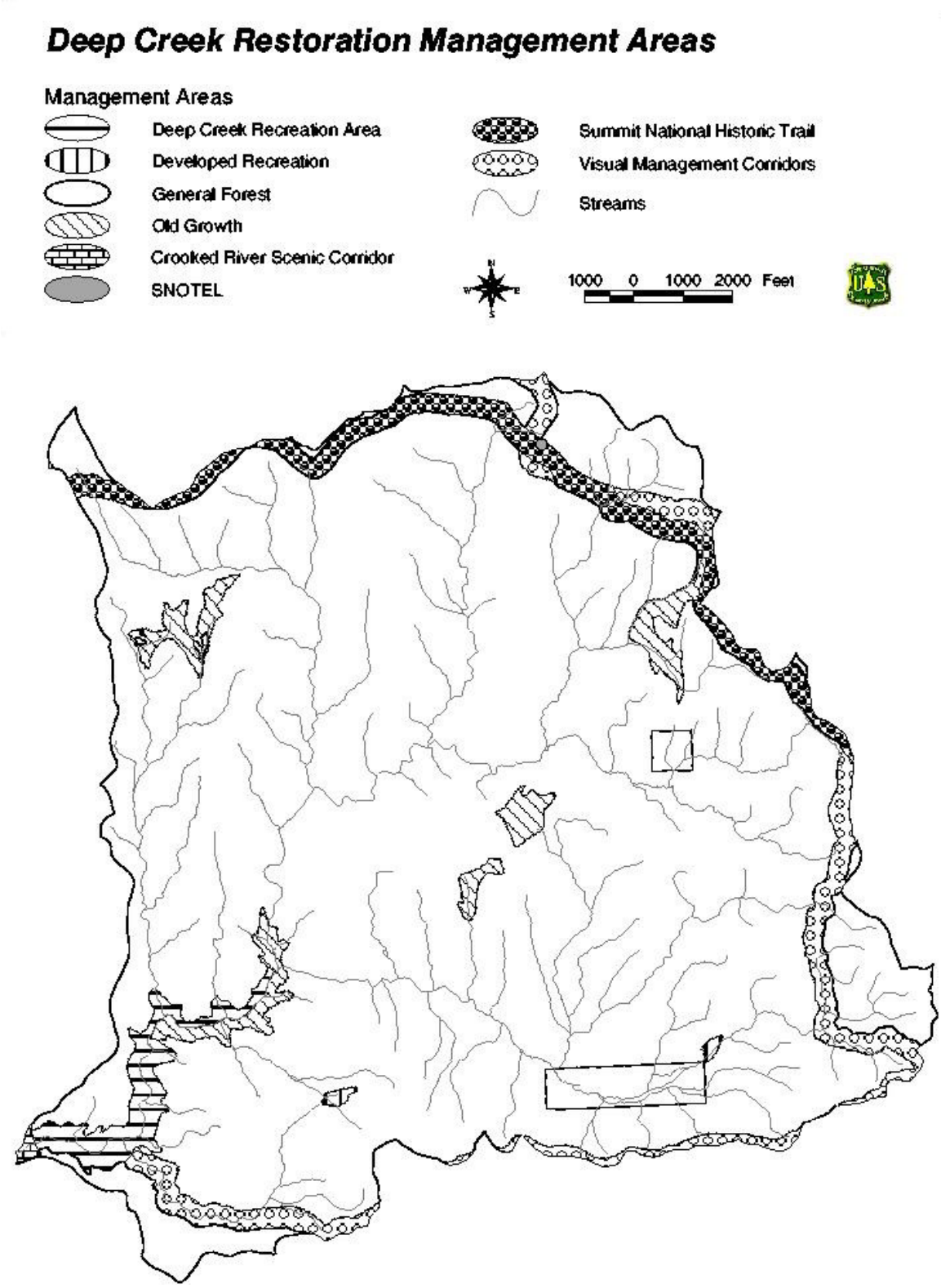


Management Areas and Direction

The following is a summary of the Management Allocations (MA) associated with the project area as allocated in the Forest Plan (Figure 2, pg. 9):

- MA-F6 Old Growth *(FP 4-58)* – Provide habitat for wildlife species dependent on old growth stands (1,267 acres or about 2% of the watershed).
- MA-F7 Summit National Historic Trail *(FP 4-60 to 4-61)* – Protect the existing integrity of the Summit Trail. Enhance and interpret significant segments for public enjoyment and education. Pristine segments will be managed to protect, interpret, and preserve their historic qualities (1,634 acres or about 3% of the watershed).
- MA-F13 Developed Recreation *(FP 4-71)* – Provide safe, healthful, and aesthetic facilities for people to utilize while they are pursuing a variety of recreational experiences within a relatively natural outdoor setting (63 acres or less than 1% of the watershed).
- MA-F14 Dispersed Recreation *(FP 4-72 to 4-73)* – Provide and maintain a near-natural setting for people to utilize while pursuing outdoor recreation experiences (approximately 30 acres or less than 1% of the watershed).
- MA-F15 Riparian *(FP 4-74 to 4-75)* – Manage streamside vegetation and habitat in order to maintain or improve water quality and meet stream temperature and turbidity levels as required by state standards under the Clean Water Act (6,332 acres or approximately 11% of the watershed).
- MA-F19 Deep Creek Recreation Area *(FP 4-81)* – Provide a near natural setting for recreational pursuits within the area where management activities are not visually evident (873 acres or about 2% of the watershed).
- MA-F22 General Forest *(FP 4-86 to 4-87)* – Produce timber and forage while meeting the Forest-wide Standards and Guidelines for all resources. In ponderosa pine stands, management will emphasize production of high value (quality) timber (48,666 acres or about 88% of the watershed).
- MA-F24 North Fork Crooked River Scenic Corridor *(FP 4-90 to 4-91)* – Management will maintain and enhance the natural appearing landscape and protect the scenic river designation (46 acres or less than 1% of the watershed).
- MA-F26 Visual Management Corridors *(FP 4-94 to 4-95)* – Maintain the natural appearing character of the Forest along major travel routes, where management activities are not evident, or are visually subordinate to the surrounding landscape (1,987 acres or approximately 4% of the watershed).
- Private Land – There are 822 acres of private land within the watershed.

Figure 2 – Designated Management Areas within the Deep Creek Watershed



Documents Tiered To

- 1989, Ochoco National Forest Land and Resource Management Plan (LRMP) and its accompanying Final Environmental Impact Statement as amended by the Revised Continuation of Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales (Eastside Screens).
- 1994, Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH).
- 1995, Inland Native Fish Strategy (INFISH).
- 1999, Deep Creek Watershed Analysis.
- 2001, Joint Aquatic and Terrestrial Programmatic Biological Assessment for Federal Lands within the Deschutes and John Day Basins.
- 2001, Deep Creek Watershed Water Quality Restoration Plan.

Alternative 2 (Proposed Action)

The proposed action (Figure 3, pg. 14) would: 1) Replace culverts to allow passage of flood flows and improve upstream access for redband trout; 2) create water developments, exclosures, and place large wood to better distribute livestock, and 3) repair headcuts and exposed cutbanks, close and decommission roads, and reconstruct channel reaches to reduce instream sedimentation. Most proposed activities would be located within RHCA's and would be designed to move the watershed towards meeting interim Riparian Management Objectives (RMOs).

For a more detailed description of the proposed action see Chapter 2, pages 11-22. For the site specific locations of activities described in the proposed action refer to the maps (Figures 3-7) in Chapter 2, pages 14-18.

Decision Framework

The Paulina District Ranger, Ochoco National Forest, is the deciding official for this proposal. The decision will focus on which alternative to select based on the purpose and need and the analysis presented in this document. The Paulina District Ranger will consider factors relating to the purpose and need, public comments, issues and environmental consequences in order to decide whether to:

- Improve stream health through headcut and stream bank stabilization and reconstruction of channels.
- Improve stream and riparian health through creating livestock exclosures and a riparian pasture.
- Improve fish access and in channel scour through the removal and/or replacement of culverts.
- Improve livestock distribution and stream health through strategic placement of water developments and large wood.
- Improve fish habitat through road treatments, large wood placement, and pool structure enhancement.

The Deciding Official may decide to select one of the alternatives, modify one of the proposed alternatives, or drop or defer treatments of this area at this time.

Public Involvement

Announcement of the proposed Deep Creek Watershed Restoration project was included in the Central Oregon Schedule of Projects in 2001, 2002, and 2003. These notifications, through quarterly mailings, reach approximately 3,200 interested individuals and groups. A Forest Service letter requesting public involvement was also provided in August of 2002 to over 100 stakeholders, elected officials, federal, state and local agency personnel, press and media in local communities, tribal representatives, and other interested individuals and organizations on the Paulina Ranger District mailing list. Seven responses were received. In addition, a field trip on August 26th, 2002 invited the public to review some of the projects proposed within the watershed. Seven members of the Forest Service and a representative from the Confederated Tribes of Warm Springs were present on this field trip. In addition, a field review of projects occurred on September 3, 2003, with the Regional Restoration Assistance Team. This team assisted in developing proposed activities.

Issues

Comments received from the public were used to focus the analysis in areas where the public desired a specific resource to be addressed. All comments received have been assessed as to their relevance to each of the resources being addressed within the watershed. Many of the comments have been addressed in the proposed action, alternative development, and analysis of the effects of actions. These comments were used to formulate issues and to design alternative activities and/or mitigations.

The comments were either brought forward as an issue or not carried through the analysis for one of the following reasons: the comment was 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. Issues were used to drive and develop alternatives to the Proposed Action. Appendix A contains a list of public comments and an explanation of their resolution.

The Forest Service identified four issues raised during the scoping process. The issues were the basis for designing Alternative 3. Each issue is followed by a more detailed explanation. Each issue has a unit of measure developed for the reader to easily distinguish between each alternative and how it responds to the issue. A comparison of the alternatives (Table 7) is located on page 28. The issues are:

1. **Fisheries:** The Deep Creek Watershed represents one the most interconnected habitat for redband trout in the basin. Redband trout are listed on the Regional Forester's Sensitive Species List. Degradation of instream habitats resulting from high road densities, and road/stream crossings, timber harvest, and livestock grazing are reasons for decreased redband populations. Threats to the Redband trout are expansion of warm water tolerant species, poor water quality, and reduced habitat range. Impacts to fisheries will be measured by the number of pools per mile, percentage of width to depth ratios exceeding the objective level, and miles of available suitable habitat.

2. **Water Quality:** Stream channel morphology has changed in the Deep Creek Watershed due to past management practices. Changes in pattern, profile, and dimension have led to water quality impaired streams. Currently, six streams within the watershed are on Oregon's 303(d) List for impaired stream temperatures, not including the North Fork

Crooked River. Changes to water quality due to proposed activities will be measured by sediment yield to the stream (in tons per year or tons per acre per year) and changes in stream temperature (^{o}F).

3. **Soils:** Soil erosion reduces overall soil quality and productivity, as well as water quality. Rapid establishment of vegetation upon activity completion is needed to control excessive soil erosion on exposed soils. The effects of the proposed activities will be measured in terms of estimated soil erosion in tons per year or tons per acre per year.

4. **Sensitive Plants:** The watershed supports large populations and habitat of plants on the Regional Forester's Sensitive Species List that are being affected by degraded riparian conditions. Past management practices have led to changed stream channel morphology and lowered water tables. This in turn has changed the vegetation composition to drier, weedier plant communities and the loss of sensitive species habitat. The effects of the alternatives will be measured by the acres of sensitive species populations and the acres of habitat affected.

Chapter 2

Alternatives, Including the Proposed Action

This chapter describes and compares the alternatives considered for the Deep Creek Watershed Restoration project. It includes a description and map of each alternative considered. This chapter also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for comparison by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternatives (i.e. acres impacted, miles of suitable stream habitat, miles of stream connectivity, etc.) and some of the information is based upon the environmental, social, and economic effects of implementing each alternative (i.e. erosion, sediment yield, stream temperature, etc.).

Alternatives

Alternatives Considered but Eliminated From Detailed Analysis

No additional alternatives were proposed by the public or needed to address comments to the proposed action. Comments that suggested specific activities were either incorporated into one of the alternatives or determined to be outside the scope of this analysis.

Alternatives Considered in Detail

Alternative 1 – No Action

Under the No Action alternative current management plans would continue to guide management of the project area (i.e. road maintenance, fire suppression, personal use firewood cutting, grazing, etc.). No stream restoration projects would occur as proposed under Alternative 2 (Proposed Action) and Alternative 3. Headcuts and cutbanks would not be fixed or stabilized. Springs would not be protected and developed to provide off site watering for wildlife and cattle. Stream channel segments that are not functioning would not be reconstructed. Large wood would not be placed to capture fine sediment, rebuild stream banks, and reduce cattle utilization along streams. Exclosures and a riparian pasture would not be built to allow the recovery of riparian vegetation and streambanks. No roads would be closed or decommissioned.

Alternative 2 – The Proposed Action

The proposed action would implement a series of activities designed to improve stream conditions. Table 1 on page 13 summarizes proposed restoration activities. The locations of stream restoration activities proposed under Alternative 2 are shown in figure 3, page 14. Table 2 on page 13 summarizes roads proposed for treatment under Alternative 2.

Table 1 – Activities Proposed Under Alternative 2

Activity	Number, Miles, or Acres
Headcut Stabilization (headcut complexes)	44
Cutbank Revetments	32
Spring Developments	5
Channel Reconstruction (miles)	0.5
Large Wood Placement (miles)	2.9
Cattle Exclosures (acres)	124
Culvert Replacements	36
Culvert Replaced with Rock Ford	3
Roads (miles)	
Closure (Inactivate)	17
Decommission	17
Reconstruction	2.50

Headcut stabilizations would involve building a sequence of small step pools with large boulders. The average headcut is 2 feet to 3 feet deep and would potentially disturb an estimated ¼ acre each. Average boulder diameter used in the repair would be 1.5 feet. Vertical steps between the pools would be no greater than 12 inches. Boulders would be "keyed" into the streambanks 5-10 feet. The objectives for fixing the headcuts would be to prevent headcuts from continuing to move upstream, improve and maintain stream channel stability, enhance or maintain the current water table and adjacent riparian species, and provide fish passage. Implementation would be performed with a spyder backhoe or equipment with similar maneuverability and soil impacts.

Cutbank revetments would include placement of large vegetative debris/rocks within raw cutbanks. Material would be "keyed" into the existing cutbank 10-15 feet at maximum. The average cutbank revetment would disturb 1/10 of an acre each. The objectives for these revetments would be to protect the streambanks from erosion, provide overhead cover for fish, and look natural. Implementation would be done with a spyder backhoe or similar piece of equipment.

Spring developments would involve fencing the source location and either creating a new, or reconstructing an existing spring box. The surrounding fence would be four strands (three strands of barbed wire with bottom wire smooth), and would vary in size by location as determined by the interdisciplinary team (IDT). Water would be piped from the spring to an off-site water trough. The objectives would be to protect cold water sources and riparian vegetation while improving livestock distribution within and outside of riparian areas.

Channel reconstruction sites would involve building a new channel with a stabilized pattern, profile, and dimension. Reconstruction would include building j-hook structures and cross vanes within the new channel. The objectives would be to create a stable stream that provide good water quality and fisheries habitat. Implementation would be performed with a spyder backhoe or similar piece of equipment.

Large wood placement would involve yarding existing dead and down wood into the stream channel and onto the adjacent floodplain to improve accumulation of fine sediment allowing the stream to rebuild streambanks, minimize cattle utilization along streambanks, and improve fish habitat. Implementation would be performed with a spyder backhoe or similar piece of equipment.

Cattle exclosures would involve building a four-strand fence (three strands of barbed wire with bottom wire smooth) to allow recovery of riparian areas and natural vegetation. Fences would be maintained until riparian vegetation is healthy as determined by monitoring.

Culvert replacements would involve pulling undersized culverts and installing a larger culvert. Some sites would require that the existing culvert is removed and replaced with a hardened rock ford. Objectives would be to allow unrestricted water flow, minimize channel scour, and improve upstream access for redband trout.

Road closures may include removal of side casted materials, culverts and cross drains, scarification or ripping where identified by the IDT, stabilization of side slopes, waterbarring, and revegetation of the road prism and/or slopes. Installation of closure devices such as barricades, earth berms, logs, large rocks, and gates may be used. Objectives would be to decrease vehicular use on the road prism so that vegetation can re-establish and decrease erosion from the road to the stream. Road closure activities would occur on about 17 miles of road (Table 2).

Table 2 - Road Closure and Decommissioning Activities Proposed Under Alternative 2

Closure (Inactivation)		Decommission			
Road Number	Miles	Road Number	Miles	Road Number	Miles
1200130	1.16	1200504	0.43	4200603	0.76
1200410	1.47	1200735	0.41	4250520	0.33
2630770	0.20	3000610	0.08	4250560	1.83
3000656	0.44	3000653	0.70	4250608	1.10
3000752	0.49	3000668	0.17	4270400	0.97
3000855	0.24	3000669	0.24	4270410	1.25
3000930	0.92	3000705	0.27	4270412	0.28
4250420	0.76	3000745	0.65	4270508	0.53
4250421	0.83	3000752	0.49	4270570	0.30
4250600	0.54	3000756	0.13	4274020	1.73
4250700	1.79	3000802	0.92	4274028	0.08
4250701	0.49	3000855	0.74	4274065	0.12
4254400	1.16	3000858	0.33	4276070	0.10
4272100	2.57	3000930	1.38		
4272400	2.15	4200510	0.13		
4272401	1.49	4200600	0.53		
4276030	0.26				
Total	**16.96**			**Total**	**16.98**

Decommissioning roads may include removing culverts and road fills from floodplains, scarifying, ripping and sub-soiling, installing waterbars, and removing ditches. It may also include removing unstable fills, recontouring the road prism, and revegetating the road prism and/or slopes. Objectives would be to eliminate the road from the existing road system, reduce compaction, increase surface roughness, and enhance vegetation recovery to decrease erosion from the road to the stream. Road decommissioning activities would occur on approximately 17 miles of road (Table 2).

Road reconstruction would be performed on 2.5 miles of road. Activities may include installing waterbars, rebuilding or improving cross drainage structures, or improving the road drainage structures such as ditches. Reconstruction would be performed on the 3000650 and 3000900 roads. The 3000900 road would also be closed.

Figure 3 – Activities Proposed Under Alternative 2 (Proposed Action) in the Deep Creek Watershed

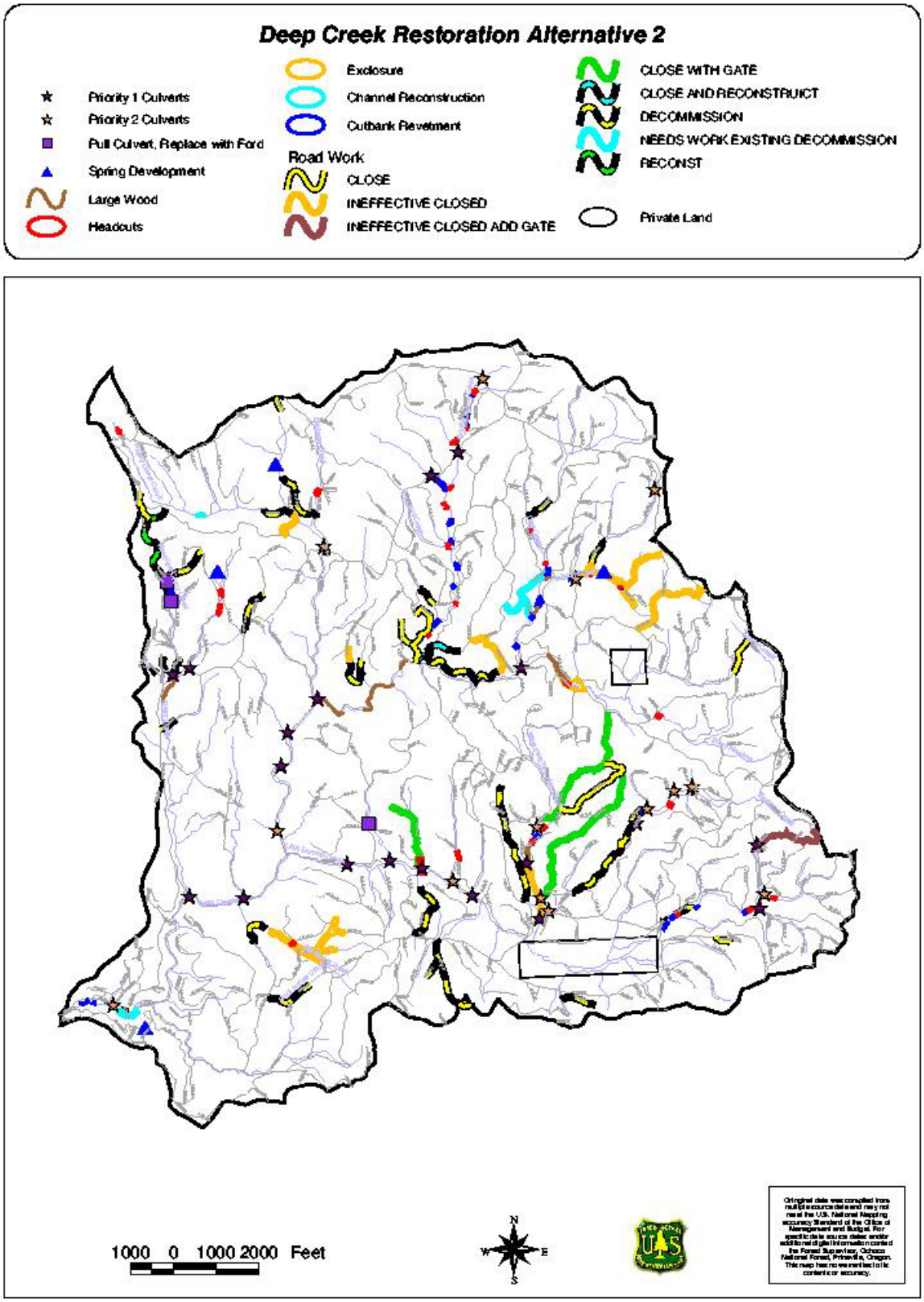


Figure 4 – Deep Creek Watershed Subwatersheds

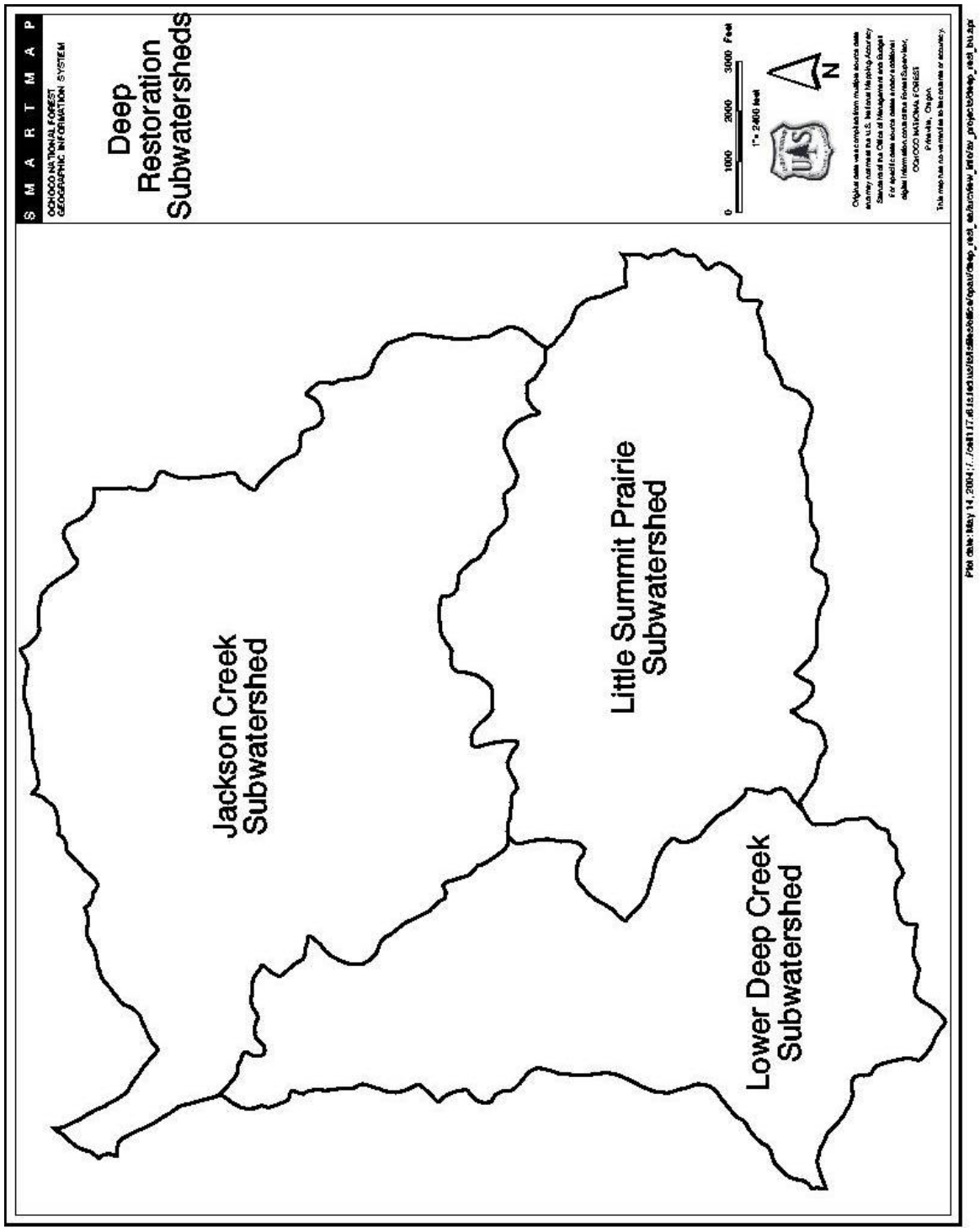


Figure 5 – Activities Proposed Under Alternative 2 (Proposed Action) in the Jackson Creek Subwatershed.

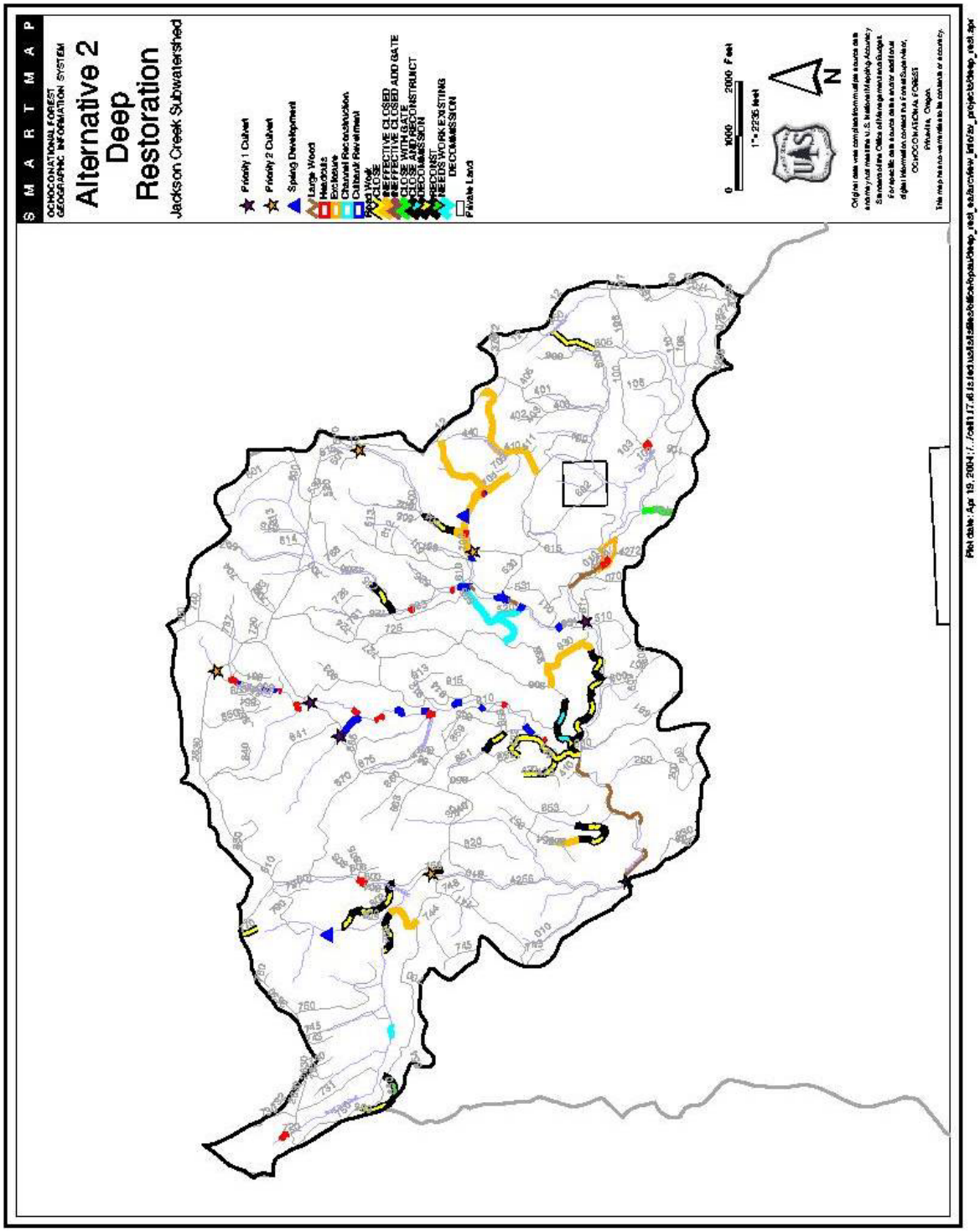


Figure 6 – Activities Proposed Under Alternative 2 (Proposed Action) in the Lower Deep Creek Subwatershed

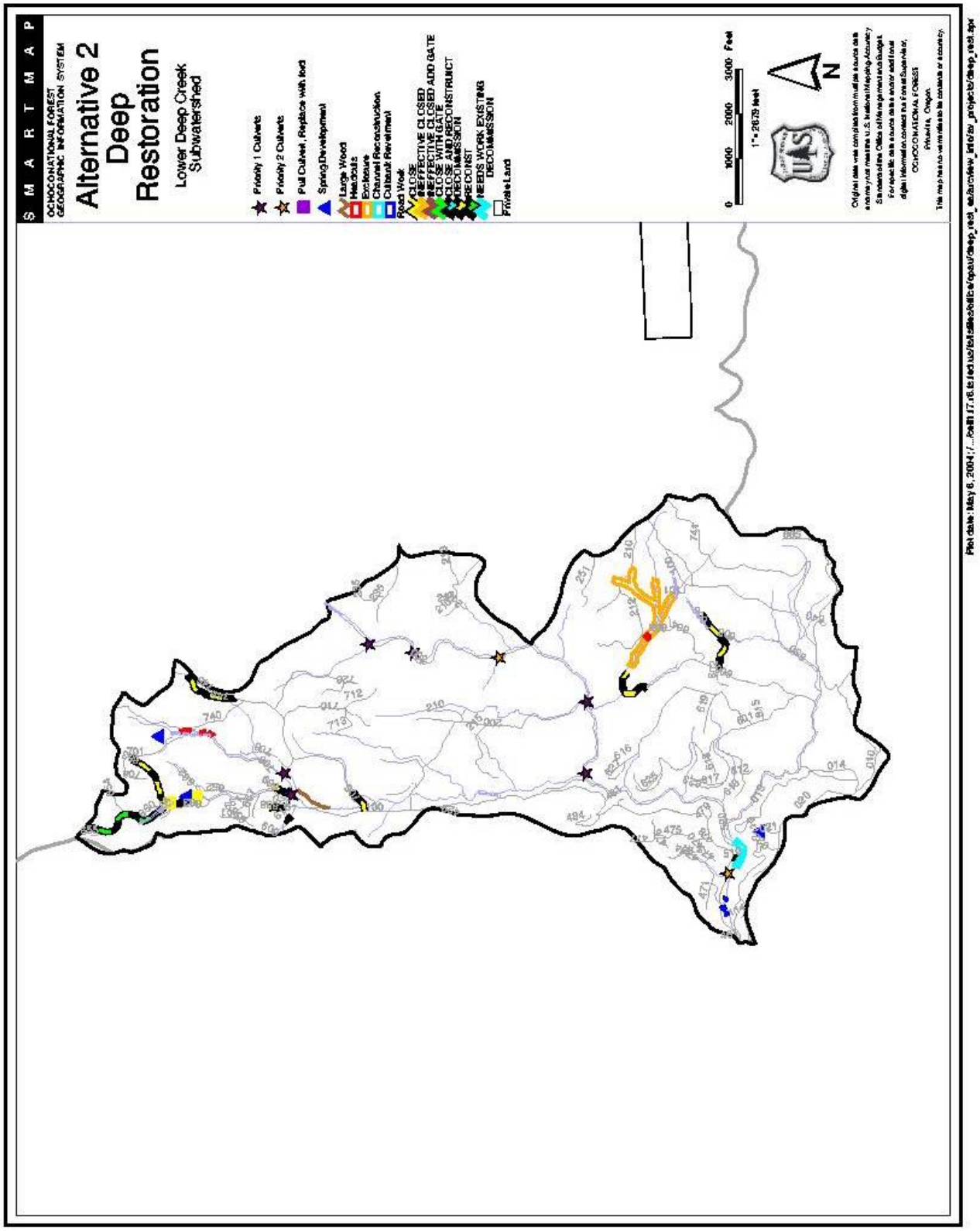
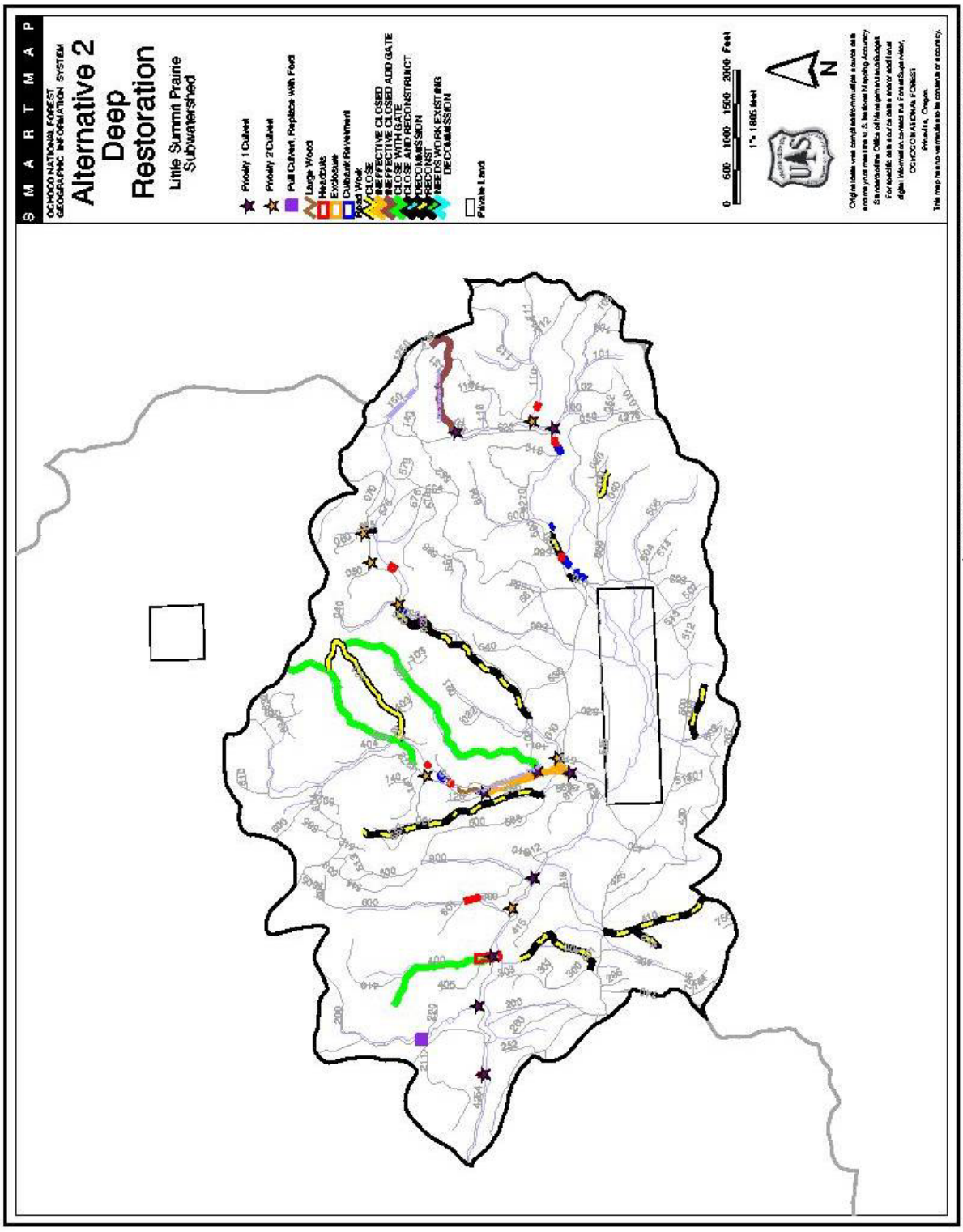


Figure 7 – Activities Proposed Under Alternative 2 (Proposed Action) in the Little Summit Prairie Subwatershed



Design Elements Associated With Alternative 2

The following design elements or mitigation measures are identified for implementation of Alternative 2 to reduce the potential for negative impacts and respond to public comments:

Botany

1. All off-road equipment would be cleaned prior to coming onto National Forest lands as to be free of soil, seeds, vegetative matter, or other debris that could contain or hold noxious weed seeds. Equipment cleaning would also apply to Government agency equipment and vehicles for projects including but not limited to: road closure, decommissioning, scarification, culvert replacement, and spring developments.
2. Equipment would be inspected prior to off-loading from the transport vehicle. If the equipment needs cleaned prior to the start of operations cleaning would occur off National Forest lands.
3. Weed-infested areas would be avoided when locating camps, equipment staging areas, and parking areas. The District Botanist would approve these locations before use.
4. All roads proposed for closure/decommissioning would be surveyed to avoid the spread of existing weeds and to determine if treatment is needed prior to closure.
5. Straw bales used for capturing sediment during roadwork or other activity would be from a field certified as weed-free.
6. Native seed would be used to revegetate all disturbed areas that result in bare ground. When native seed is not available, short-lived species such as *Triticum aestivium* and *Lolium perenne ssp multiflorum* would be used. The District Botanist and Range Conservationist would determine the species mix. All seed would be certified as weed-free.
7. All materials used in the project would come from noxious weed-free sources, including logs, rock, boulders, fill-dirt, and gravel. The District Botanist would be consulted before bringing in these materials.
8. If rock, gravel, fill material, etc. is needed from off National Forest lands, this material would be weed-free. The District Botanist would inspect the site.
9. The Forest Service Botanist would certify sites for stockpiling material as weed-free prior to use.
10. Periodic inventory for noxious weeds for each project would occur for approximately two years (or until the site is revegetated).
11. Activities involving soil excavation, in Peck's mariposa lily habitat, would remove topsoil to a depth of 12", stockpile it on site, and the topsoil would then be put back on the original area. The activities within Peck's lily sites are listed in Table 3.
12. To minimize direct effects to sensitive plant populations, the District Botanist would be involved in the design and implementation of activities within sensitive plant populations. The activities proposed under this alternative are listed in Table 3.
13. To minimize direct and indirect effects to Peck's mariposa lily, the activities listed in Table 3 would not occur until after bulb dormancy, August 20th:
14. Disturbance and access would be limited to the immediate project site for the activities listed in Table 3. The District Botanist would flag areas where travel is restricted.
15. Motorized vehicles used in road closures, decommissioning and road reconstruction would be restricted to the road prism on the 4274020, 4270570, 4270400, and 4250520 roads.
16. Road decommissioning activities would not take place within Peck's mariposa lily populations. Heavy equipment would remain on the road prism, and ripping or other disturbance would not take place within the riparian area. The District Botanist would be consulted during road decommission projects.

Table 3 – Sites and Activities that have Botanical Restrictions under Alternative 2 (Design Elements 11,12,13, and 14).

ACTIVITY	Stream Name	Design and Implement	Stockpile Topsoil	After August 20	Restricted Access
Headcut T13S, R23E, Sec 36	Derr	**X**	**X**	**X**	**X**
Headcut T13S, R23E, Sec 10	Double Corral	**X**	**X**	**X**	**X**
Headcuts T14S, R23E, Sec 14	W. Thornton	**X**	**X**	**X**	**X**
Headcuts (2 areas)T14S, R23E,S 23	W. Thornton	**X**	**X**	**X**	**X**
Headcuts T14S, R24E, Sec 18	Thornton	**X**	**X**	**X**	**X**
Headcut T14S, R24E, Sec 20	Little Summit	**X**	**X**	**X**	**X**
Headcut T14S, R24E, Sec 19	Little Summit	**X**	**X**	**X**	**X**
Headcuts T14S, R23E, Sec 15	L.Summit trib	**X**	**X**	**X**	**X**
Headcuts T14S, R23E, Sec 17	Little Summit	**X**	**X**	**X**	**X**
Headcut T13S, R23, Sec 26	Jackson	**X**	**X**	**X**	**X**
Channel Recon.T14S, R22E, Sec 26	Deep	**X**	**X**	**X**	**X**
Cutbank (2 areas) T14S, R24E, S 20	Little Summit	**X**	**X**	**X**	**X**
Cutbank (5 areas) T14S, R24E, S 19	Little Summit	**X**	**X**	**X**	**X**
Cutbank T14S, R23E, Sec 13	Thornton	**X**	**X**	**X**	**X**
Cutbank (3 areas) T14S, R22E, S 27	Deep	**X**	**X**	**X**	**X**
Cutbank T13S, R23E, Sec 10	Double Corral	**X**	**X**	**X**	**X**
Cutbank T13S, R23, Sec 26	Jackson	**X**	**X**	**X**	**X**
Cutbank T13S, R23, Sec 35	Jackson	**X**	**X**	**X**	**X**
Cutbank T14S, R23E, Sec 14	W. Thornton	**X**	**X**	**X**	**X**
Culvert T14S, R24E, Sec 20	Little Summit	**X**	**X**	**X**	**X**
Culvert T13, R23E, Sec 25	Jackson	**X**	**X**	**X**	**X**
Spring Dev. T13S, R22E, Sec 25	Goofy Spring	**X**			
Exclosure T14S, R23E, Sec 23	Thornton	**X**			

Wildlife

17. Timing restrictions would be placed on all ground disturbing activities that require heavy equipment (caterpillar tractors, walking skidders and back-hoes, etc.) and would occur within or adjacent to active, established northern goshawk post fledging areas (PFA) an/or nest stands. Restrictions would occur from March 1 to September 30. The following actions and locations would be restricted:
    - 4270410 road decommissioning
    - 4270412 road decommissioning
    - 3000900 road closure and reconstruction of drainage
18. Timing restrictions would be placed on project activities involving ground disturbance by heavy equipment (caterpillar tractors, walking skidders and back-hoes, etc.) that occurs within or adjacent to areas of heavy elk calving and calf rearing activity. These areas were established based upon telemetry data from several radio collared elk studies. The following activities would be restricted from May 15 through June 30:
    - 3000752 road decommissioning
    - 3000802 road decommissioning

- 4270410 road decommissioning, southern half
- 4270412 road decommissioning

Hydrology and Fisheries

19. The Deep Creek and Happy Camp channel reconstruction sites would have temporary livestock exclosure fences built prior to allowing cattle on the site. Exclosure fences would be temporary electric fences taken down each year after grazing. Fence would remain in use until vegetative recovery, as determined by monitoring. Specified headcut locations may also be fenced, determined on a site-specific basis by the soil scientist, fisheries biologist, botanist, and hydrologist.
20. All instream work would be done during dry weather conditions and low stream flows, as decided by Oregon Department of Fish and Wildlife Instream Work Guidelines, soil scientist, fisheries biologist, and hydrologist.
21. All channel reconstruction locations would be electro-fished (if fish present) and all fish will be relocated from the immediate working area.
22. All ground disturbing activities such as channel reconstructions, cutbank revetments, culvert repairs, road closures/decommissionings, and headcut repairs would be evaluated for seeding/planting. Refer to the Botany section for revegetation guidelines..
23. Erosion control sediment fences would be used to prevent sediment entry into streams.

Range

24. Existing livestock fences, cattle guards, and other developments would be protected and/or returned to their original condition after restoration operations.
25. Restoration activities and pasture rest would be coordinated with range permittees as needed.
26. Fence maintenance responsibilities would be assigned and agreed upon before construction.
27. Livestock exclosure lifespan and reevaluation periods would be identified and agreed upon by the IDT before construction.

Silviculture

28. Delay road treatments on the 4270410 road until 2006.

Heritage Resources

29. All cultural resource design elements are site specific to both prehistoric and historic archaeological sites. This information is Freedom of Information Act (FOIA)-exempt.

    A cultural resource survey was conducted at each of the proposed project locations where a known archaeological site was within or adjacent to the project boundary of possible affects. Surveys were also conducted in proposed project areas where no archaeological sites are known to occur but are considered high probability land for the occurrence of cultural materials. A detailed site-specific list of design elements was developed for archaeological sites adjacent to proposed project locations, for the protection of cultural materials. For those archaeological sites that could not be avoided by project design, the project was dropped from consideration and will not be implemented. Ground disturbing activities always have the potential to expose subsurface cultural materials previously unknown from surface surveys. During implementation of proposed activities for this project, if cultural materials are discovered, the activity will stop until a site specific set of design criteria can be developed for the protection and/or avoidance of these newly found materials.

Soils

30. Mechanical operations would be avoided and/or suspended during periods of excessive soil moisture conditions as determined by the soil scientist.
31. Silt fences would be placed on completion of road closures/decommissioning to reduce short-term potential for sediment reaching the channels. Locations would be determined by the district roads manager, soil scientist, and hydrologist.
32. Road closure/decommissioning activities may include waterbars, felling trees into the road prism, ripping, re-contouring, gating or seeding. Design elements would ensure that closures are effective and not subject to bypass.
33. All channel reconstruction and cutbank revetment activities would utilize low impact/footprint, ground-based equipment on soils to reduce compaction and loss of vegetative ground cover.
34. Restoration activities such as headcut repairs and channel reconstructions would have proper protection (fences, wood placement) before livestock access the site.
35. Native seed would be used to revegetate all disturbed areas that result in bare ground. When native seed is not available, short-lived species such as *Triticum aestivium* and *Lolium perenne ssp multiflorum* would be used. The District Botanist and Range Conservationist would determine the species mix. All seed would be certified as weed-free.
36. Culvert replacements would decrease the potential erosion and sediment input during and after construction activities (e.g., adequate ditch relief, cross drains, wing wall rapping).
37. Restoration activities would not reduce vegetative cover to the extent of creating stream bank instability (90% stable stream banks).
38. Restoration activities would save and reuse existing vegetation (sedge mats, shrubs).
39. Machinery would be excluded from scab landtypes (P4, P5, P54 soil types) due to the sensitive nature of these areas. Existing roads may be used.
40. Existing spring boxes would be utilized to limit new ground and vegetation disturbance when possible.
41. Spring developments would be fenced with a four-strand, wildlife friendly wire fence to protect soil and vegetation. Water would be piped to an off-site watering trough in an area agreed upon by the permittee and resource specialists.
42. Decommissioned roads would be ripped in order to reduce compaction, increase surface roughness, and enhance vegetation recovery.

Roads

43. Road closure and decommissioning projects would confine equipment to the existing road prism. Any operation that requires disturbance outside of the road prism would be coordinated with the District/Forest hydrologist, fisheries biologist, archeologist, and botanist.
44. Entrance closures: 1) shall be placed in areas that provide for effective road closure and resource protection; 2) shall not be placed in scabs, meadows, streams, large openings, or areas that allow for closure to be driven around; 3) shall be placed beyond dispersed recreation sites that are located within the first 500 feet of a road; and 4) should be monitored for effectiveness one to two years after implementation. Earth berms, gate(s), brush, logs, and or rocks may be used to close road entrances. These may be used singly or in some combination.
45. Waterbars would be spaced at least 100 ft apart on slopes greater than 5% and no greater than 300 feet apart on slopes less than 5%. Waterbars would be cut to the depth of the existing ditch and placed on each side of all stream crossings.

46. All road treatments would be evaluated for seeding/planting as discussed in previous design elements.
47. Road treatments may include scarification or ripping, which may be done with a dozer blade or tractor equipped with ripper teeth. Ripping depths would range from 6 to 36 inches. Site specific treatments may be performed to improve subsurface and surface drainage.
48. Culvert removals would mimic the natural stream slope and elevation of the stream channel. Road banks would mimic natural, vegetated stream banks.

Alternative 3

This alternative proposes similar activities to those in Alternative 2. Table 4 summarizes proposed restoration activities for this alternative. Figure 4 on page 23 identifies locations that are proposed for stream restoration activities. Table 5 summarizes proposed road closure and decommissioning activities for Alternative 3.

Table 4 – Activities Proposed Under Alternative 3

Activity	Number, Miles, or Acres
Headcut Stabilization (headcut complexes)	37
Cutbank Revetments	18
Spring Developments	7
Channel Reconstruction (miles)	0.25
Large Wood Placement (miles)	3.6
Grazing Exclosures (acres)	226.6
Riparian Pasture (acres)	341.5
Culvert Replacements	35
Culvert Replaced with Rock Ford	3
Fisheries Habitat Enhancement (structures)	4 to 6
Roads (miles)	
Closure (Inactivation)	17.20
Decommission	27.37
Reconstruction	2.5

There are two additional activities proposed under Alternative 3: fisheries habitat enhancement and the building of a riparian pasture (Table 4). Habitat enhancement would involve building 4 to 6 instream structures (either vanes or j-hooks) to promote pool habitat for fisheries. This activity would occur on Lower Deep Creek instead of implementing the channel reconstruction as proposed under Alternative 2. The objective would be to improve fisheries habitat while minimizing the effects to sensitive plants. Work would be performed with a spyder backhoe.

Figure 8 – Activities Proposed Under Alternative 3

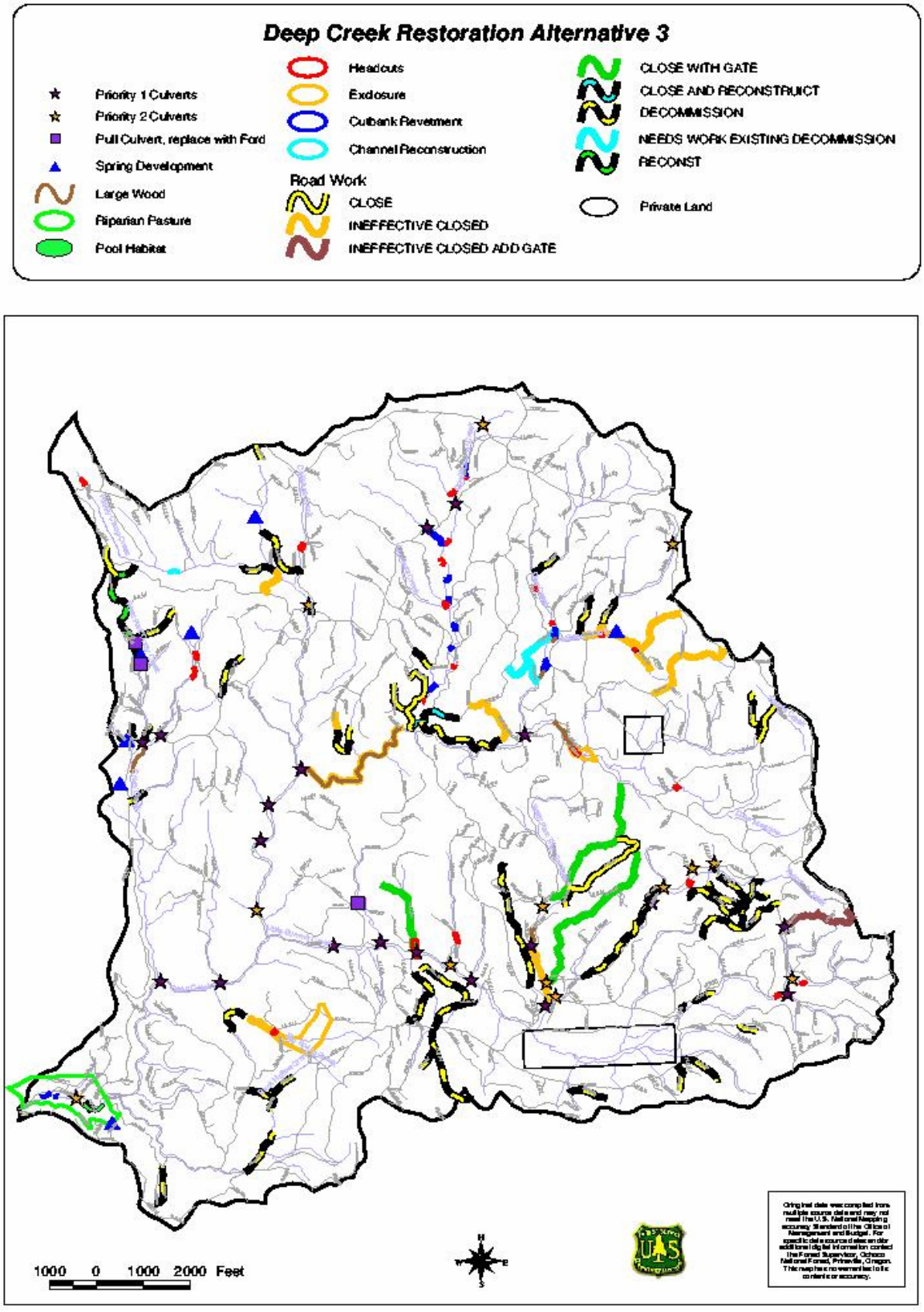


Figure 9 – Deep Creek Watershed Subwatersheds

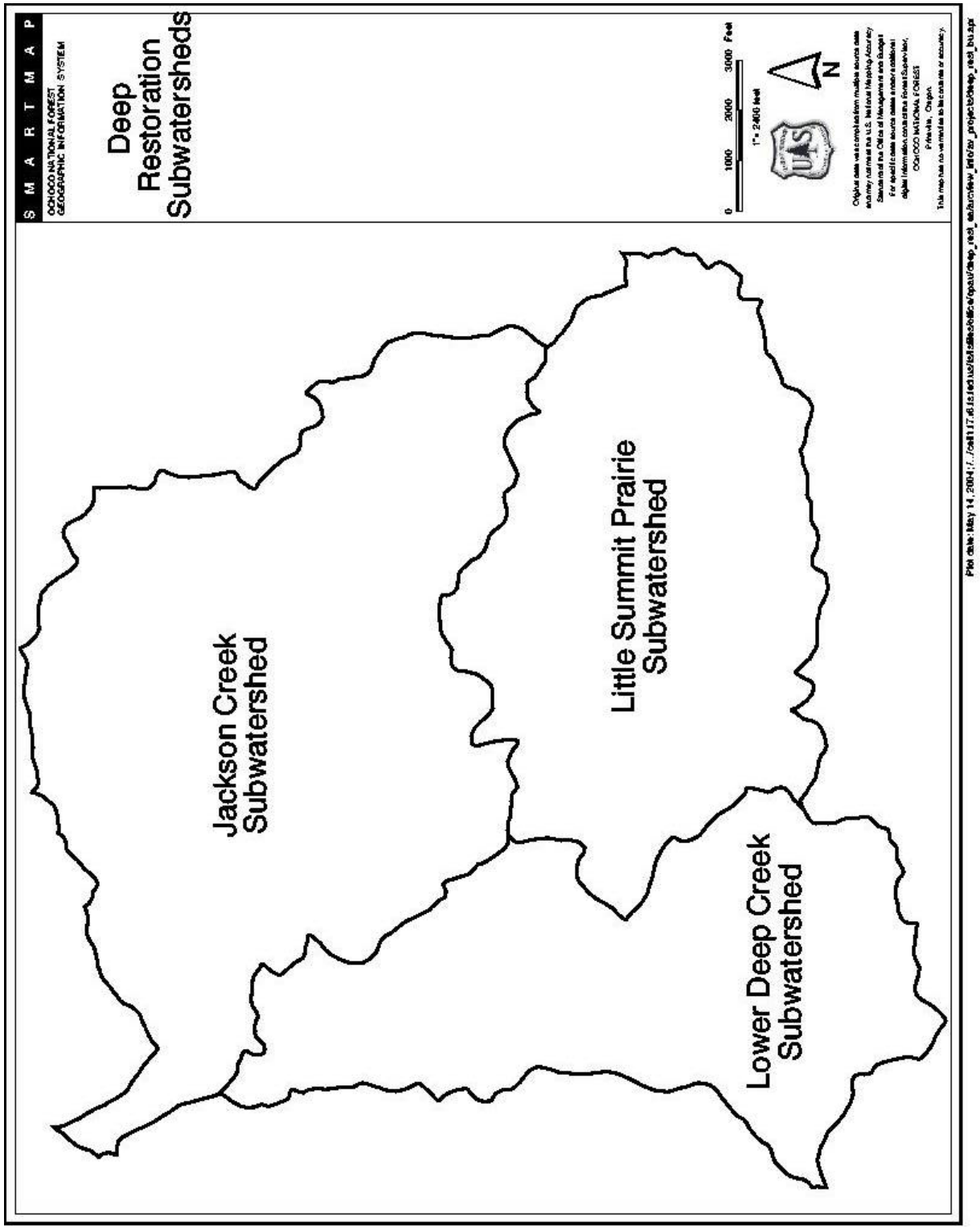


Figure 10 – Activities Proposed Under Alternative 3 in the Jackson Creek Subwatershed

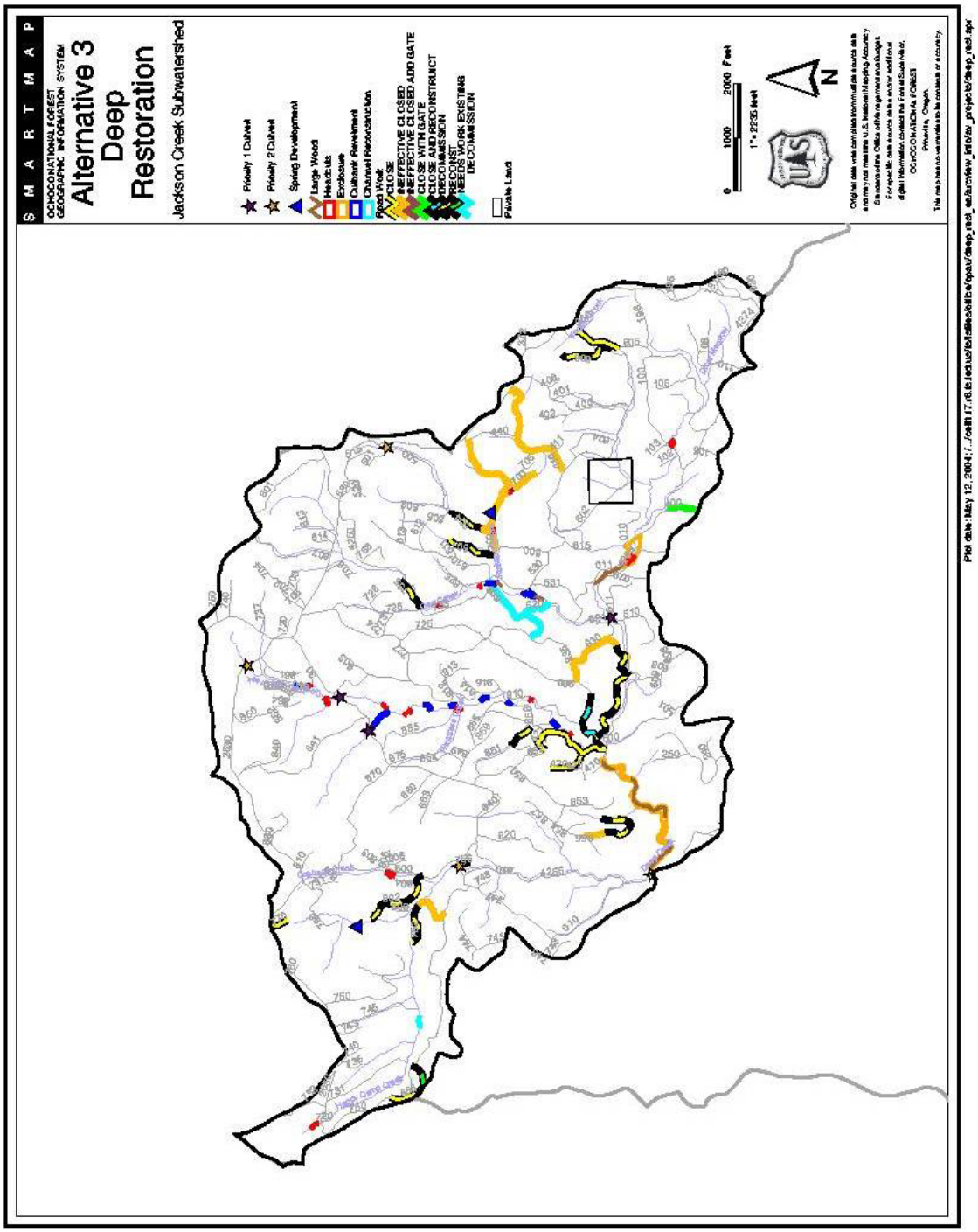


Figure 11– Activities Proposed Under Alternative 3 in the Lower Deep Creek Subwatershed

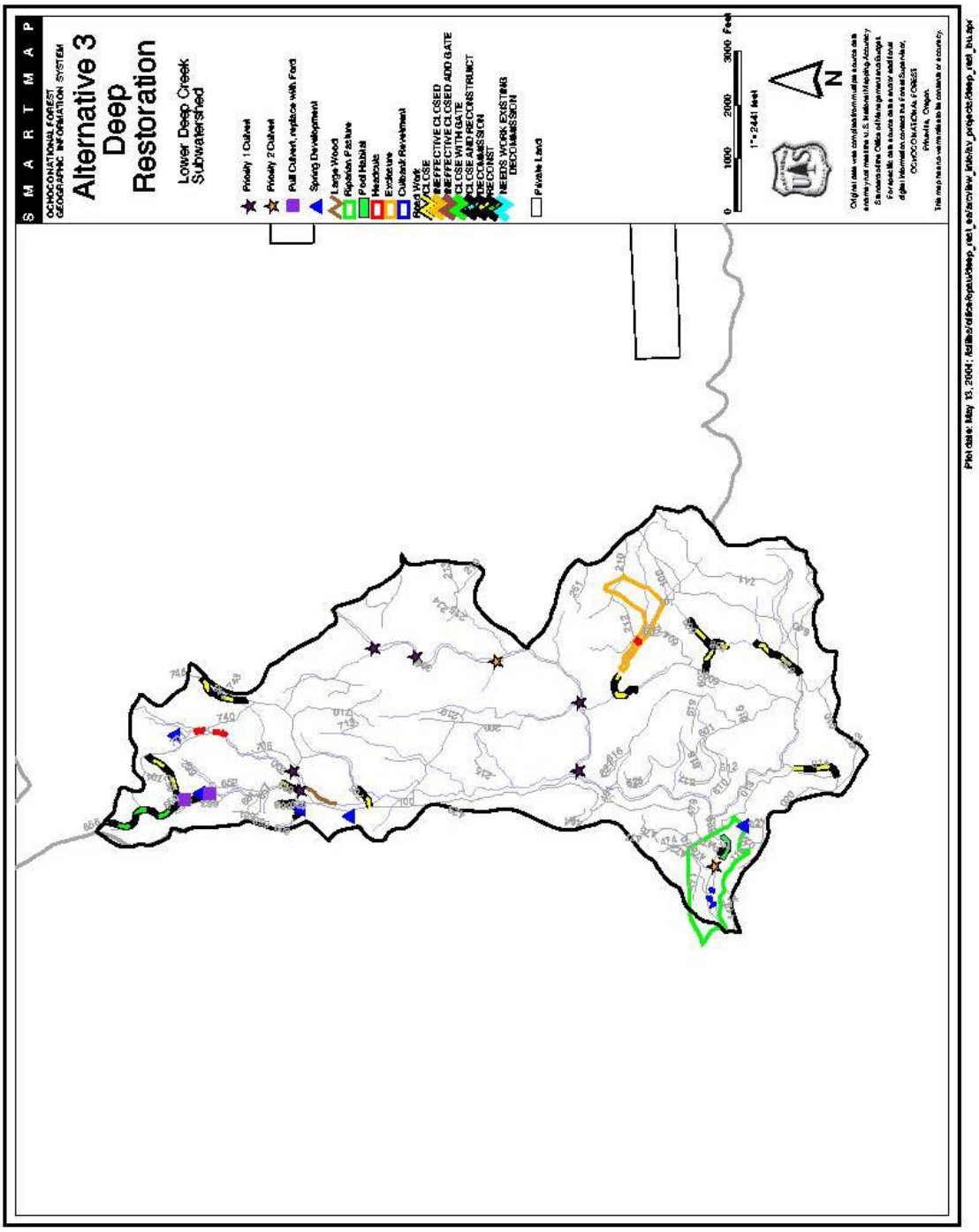
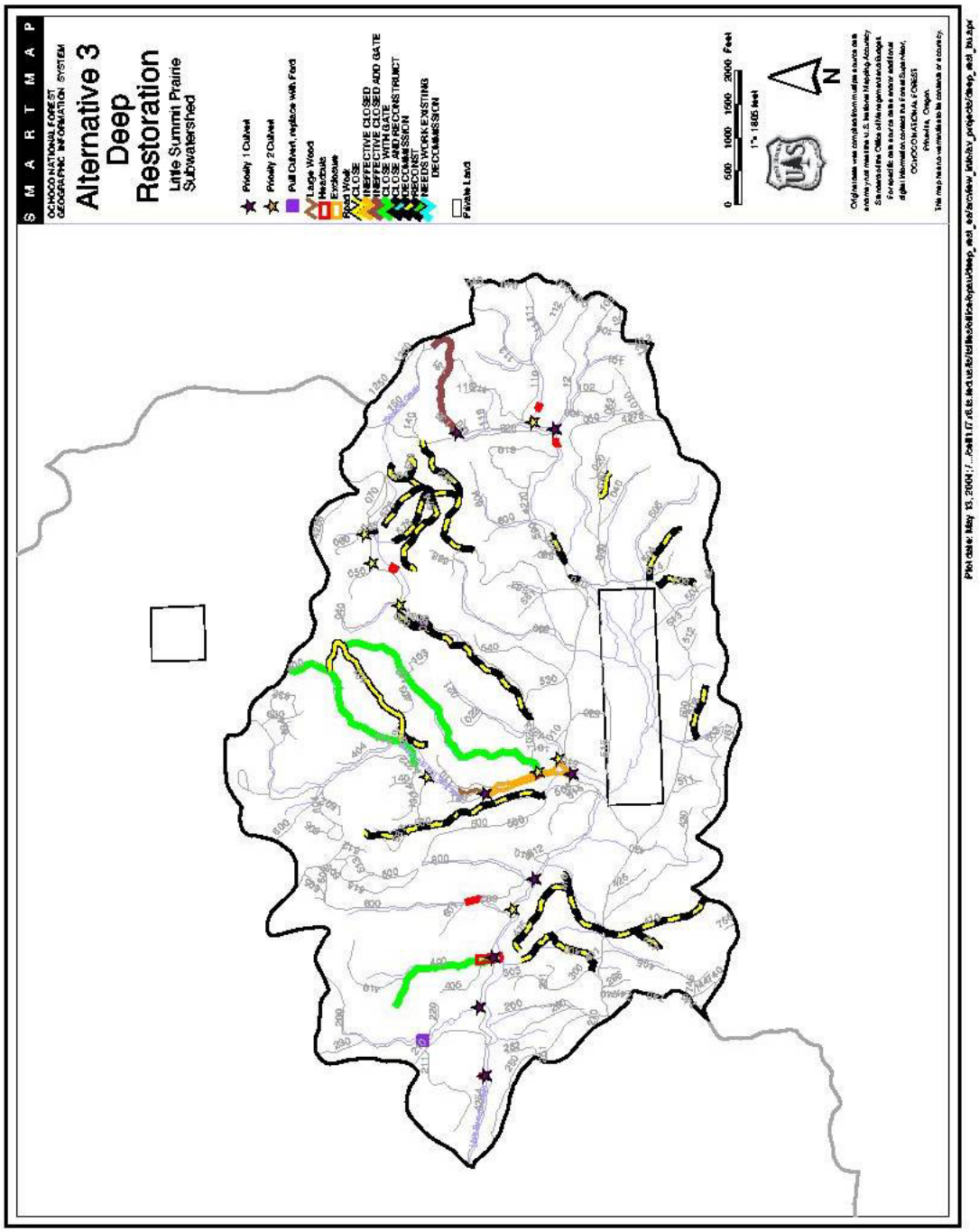


Figure 12 – Activities Proposed Under Alternative 3 in the Little Summit Prairie Subwatershed



The riparian pasture would be approximately 340 acres in size. The fence would be 4 strand (three strands of barbed wire with bottom wire smooth). The objective would be to allow recovery of riparian vegetation and streambanks. Life expectancy of the pasture would be determined by the IDT.

Road closures may include removal of side casted materials, culverts and cross drains, scarification or ripping where identified by the IDT, stabilization of side slopes, waterbarring, and revegetation of the road prism and/or slopes. Installation of closure devices such as barricades, earth berms, logs, large rocks, and gates may be used. Objectives would be to decrease vehicular use on the road prism so that vegetation can re-establish and decrease erosion from the road to the stream. Decommissioning roads may include removing culverts and road fills from floodplains, scarifying, ripping and sub-soiling, installing waterbars, and removing ditches. It may also include removing unstable fills, recontouring the road prism, and revegetating the road prism and/or slopes. Objectives would be to eliminate the road from the existing road system, reduce compaction, increase surface roughness, and enhance vegetation recovery to decrease erosion from the road to the stream

Table 5 – Roads Proposed for Closure or Decommissioning Under Alternative 3

Closure (Inactivation)		Decommission			
Road Number	Miles	Road Number	Miles	Road Number	Miles
1200130	1.16	1200504	0.43	4250608	1.10
1200410	1.47	1200735	0.41	4260014	0.58
2630770	0.20	3000610	0.08	4270400	0.97
3000656	0.44	3000653	0.70	4270410	1.25
3000752	0.49	3000668	0.17	4270412	0.28
3000855	0.24	3000669	0.24	4270415	1.44
3000930	0.92	3000705	0.27	4270416	0.14
4250420	0.76	3000745	0.65	4270503	0.38
4250421	0.83	3000752	0.49	4270504	0.58
4250600	0.54	3000756	0.13	4270508	0.53
4250700	1.79	3000802	0.92	4270514	0.30
4250701	0.49	3000855	0.74	4270562	1.42
4254400	1.16	3000858	0.33	4270564	0.80
4272100	2.57	3000930	1.38	4270570	0.30
4272400	2.15	4200510	0.13	4270574	0.93
4272401	1.49	4200600	0.53	4270576	0.62
4276030	0.26	4200603	0.76	4270578	0.53
		4200608	0.24	4270579	0.22
		4200630	0.68	4272402	0.28
		4250520	0.33	4274020	1.73
		4250560	1.83	4274028	0.08
		4250601	0.57	4274065	0.12
		4250606	0.68	4276070	0.10
Total	**17.20**			**Total**	**27.37**

Design Elements for Alternative 3

The following design elements or mitigation measures are identified for implementation in this alternative to reduce the potential for negative impacts and respond to public comments.

Botany

Common botany design elements from Alternative 2 include elements 1 through 10 and 16. Additional elements are:

1. Activities involving soil excavation in Peck's mariposa lily habitat would remove topsoil to a depth of 12"and stockpile it on site. The topsoil would be put back on the original area upon completion of the activity. The activities within Peck's lily sites are listed in Table 6.
2. The District Botanist would be involved in the design and implementation of activities within sensitive plant populations. The activities are listed in Table 6.
3. Some of the activities listed in Table 6 would not occur until after bulb dormancy, approximately August 20th.
4. Disturbance and access would be limited to the immediate project site for the activities listed in Table 6. The District Botanist would flag areas where travel is restricted.
5. Motorized vehicles used in road closures, decommissioning and road maintenance would be restricted to the road prism on the following roads: 4274020, 4270570, 4270400, 4250520, 4270503, 4200630, 4200603, 4270564, 4270579, and 4250606.

Table 6 – Sites and Activities that have Botanical Restrictions Under Alternative 3 (Design Elements 1, 2, 3, and 4).

ACTIVITY	Stream Name	Design and Implement	Stockpile Topsoil	After August 20	Restricted Access
Headcut T13S, R23E, Sec 36	Derr	**X**	**X**	**X**	**X**
Headcuts (2 areas) T14S, R23E, S 23	W. Thornton	**X**	**X**	**X**	**X**
Headcuts T14S, R24E, Sec 18	Thornton	**X**	**X**	**X**	**X**
Headcut T14S, R24E, Sec 20	Little Summit	**X**	**X**	**X**	**X**
Headcuts T14S, R23E, Sec 15	L.Summit trib	**X**	**X**	**X**	**X**
Headcuts T14S, R23E, Sec 17	Little Summit	**X**	**X**	**X**	**X**
Channel Recon.T14S, R22E, S 26	Deep	**X**	**X**	**X**	**X**
Cutbank (3 areas) T14S, R22E, S 27	Deep	**X**	**X**	**X**	**X**
Culvert T14S, R24E, Sec 20	Little Summit	**X**	**X**	**X**	**X**
Culvert T13, R23E, Sec 25	Jackson	**X**	**X**	**X**	**X**
Spring Dev. T13S, R22E, Sec 25	Goofy Spring	**X**			
Exclosure T14S, R23E, Sec 23	Thornton	**X**			

Wildlife

Common wildlife design elements from Alternative 2 include element 18. Additional elements are:

6. Heavy equipment would not be allowed to operate within or adjacent to northern goshawk post fledging areas and/or nest stands from March 1 to September 30. The following locations would be subject to these restrictions;
    - 4270410 road decommissioning
    - 4270412 road decommissioning
    - 3000900 road closure and reconstruction of drainage
    - 4270562 road decommissioning, southwest portion

Hydrology and Fisheries

In addition to hydrology and fisheries design elements 20-23 from Alternative 2, the following addition would be made:

7. The channel reconstruction site on Happy Camp Creek would have a temporary livestock exclosure fence built prior to allowing cattle access upon the site. The exclosure fence would be a temporary electric fence, to be taken down each year after grazing. The fence would be used until vegetative recovery, as determined by the rangeland management specialist, hydrologist, botanist, and fisheries biologist.

Range

In addition to those range design elements from Alternative 2, the following additions would be made:

8. Prior to grazing the riparian pasture it would be monitored for vegetative recovery and bank stabilization and the potential for reduced sediment input to Deep Creek. The rest period may be extended if conditions are not met.

Silviculture

9. Road treatments on the 4270410, 4270503, and 4270504 roads would be delayed until 2006.

Heritage Resources

All cultural resource design elements are site specific to both prehistoric and historic archaeological sites. This information is Freedom of Information Act (FOIA)-exempt.

Soils

All soils design elements are common to those in Alternative 2.

Roads

All roads design elements are common to those in Alternative 2.

Comparison of the Alternatives

This section provides a summary of each alternative. Table 7 below compares the alternatives in relation to the activities proposed in Alternative 1 (No Action), Alternative 2 (Proposed Action), and Alternative 3. The major differences between Alternatives 2 and 3 are: 1) all cutbank revetment projects proposed in Alternative 2 within sensitive plant populations would not occur, 2) headcut repairs within Peck's lily populations from Alternative 2 would only occur in Alternative 3 where necessary to stop further upstream habitat degradation and loss within a population, 3) channel reconstruction would not occur on Lower Deep Creek in Alternative 3, but fisheries habitat enhancement would occur, 4) an added exclosure on Jackson Creek and bigger exclosures in Alternative 3, 5) more roads closed and decommissioned, springs developed and large wood placed in Alternative 3, 6) the addition of a riparian pasture in Alternative 3, and 7) one less culvert replacement in Alternative 3.

Table 7 – Alternative Comparison

Activity	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3
Headcut Stabilization (headcut complexes)	0	44	37
Cutbank Revetments	0	32	18
Spring Developments	0	5	7
Channel Reconstruction (miles)			
Deep Creek	0	0.25	0
Happy Camp Creek	0	0.25	0.25
Large Wood Placement (miles)			
Jackson Creek	0	1.7	2.4
Toggle Creek	0	0.5	0.5
West Fork Thornton Creek	0	0.3	0.3
Crazy Creek	0	0.4	0.4
Grazing Exclosures (acres)			
Jackson Creek	0	0	53.2
Toggle Creek	0	22.5	22.5
West Fork Thornton Creek	0	21.3	22.1
Big Springs	0	79.7	128.8
Riparian Pastures (acres)			
Lower Deep	0	0	341.5
Culvert Replacements			
Priority 1	0	19	19
Priority 2	0	14	13
Culverts Replaced with Rock Fords	0	3	3
Fisheries Habitat Enhancement (structures)	0	0	4 to 6
Roads (miles)			
Closure	0	16.96	17.20
Decommission	0	16.98	27.37
Reconstruction	0	2.5	2.5

Chapter 3

Affected Environment and Environmental Consequences

The following section summarizes the physical, biological, social, and economical environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. Probable effects are discussed in terms of environmental changes from the current condition and include qualitative as well as quantitative assessments of direct, indirect, and cumulative effects. It also presents the scientific and analytical basis for comparison of alternatives. The following discussions of existing conditions and effects analysis are taken from each resource specialist's write-up. The full text of each write-up is available upon request at the Paulina Ranger District Office.

Issue 1: Fisheries

Fisheries Measure #1 – Pools per Mile

Existing Condition

Pool densities within the Deep Creek Watershed are variable and reach dependent. On average, pool frequency on surveyed reaches within the Deep Creek Watershed is approximately 65 pools per mile. Pool frequency is below the Riparian Management Objective Level(s) in 70 percent of surveyed stream reaches. As defined by INFISH, the pool frequency objective levels are based upon the wetted width of the stream (1995, Table 8). This interim guideline was used for reference in this analysis. For further information on the condition of pools within the Deep Creek Watershed refer to the complete fisheries write-up, the Deep Creek Watershed Analysis (USFS 1999), and the Deep Water Quality Restoration Plan (USFS, 2001a).

Table 8 – INFISH Interim Objectives for Pool Frequency.

Wetted Width (ft)	10	20	25	50	75	100	125	150	200
Pools per Mile	96	56	47	26	23	18	14	12	9

Pools provide essential fish habitat for summer and winter rearing and provide important habitat in intermittent streams. If flow is reduced to non-flowing conditions pools become isolated habitats for summer rearing. Size and volume of these pool habitats are important for ensuring fry capacity and suitable dissolved oxygen and water temperatures.

Environmental Effects

Alternative 1 - No action

Direct and Indirect Effects: Streams would not meet interim INFISH (1995) guidelines for pools per mile. Pools per mile would remain below objective levels (Table 8) as described in the existing condition section. There would be no adverse effect to the present interior redband trout population; however no improvements to the population status would occur in the Deep Creek Watershed. The current habitat would remain in poor condition. Identified sources of water

quality problems would not be corrected as identified in the Deep Creek Watershed Analysis (USFS 1999) and the Deep Water Quality Restoration Plan (USFS 2001).

Cumulative Effects: Cumulative effects where estimated based on past management and reasonably foreseeable future actions. A list of those activities considered is in the Official Project File located at the Paulina Ranger District Office.

Implementation of Alternative 1 would have no adverse cumulative effect to redband trout By not implementing projects that would correct issues related to poor water quality and fish habitat, the Forest Service would not be meeting the goals and objectives outlined by the LRMP, Department of Environmental Quality (DEQ), INFISH, the Deep Creek Watershed Analysis, and the Deep WQRP. Foreseeable projects proposed under the Deep SEIS would help move stream conditions towards recovery and better pool spacing. Activities such as riparian planting 28 miles, placing large wood over 7.4 miles, rehabilitating 6 dispersed recreation sites, replacing 8 culverts, enhancing 825 acres of meadows, closing 16.2 miles of road, and decommissioning 15.2 miles of road would all lead to improved stream conditions over time. With improved stream conditions, pool spacing would eventually improve from this project.

The Westside Allotment analysis that is currently being analyzed on the Paulina Ranger District would address cattle allotments and possible needs for change to Allotment Management Plans (AMPs) to benefit stream health and pool frequency. Outcomes are expected to address grazing and how best to manage those resources that are affected by grazing.

Past activities such as headcut repairs in Derr Meadow, Timothy Meadow, and Happy Camp Creek have been implemented to minimize the loss of existing pool habitat. Culvert replacements on Buck Hollow and Happy Camp Creeks have been implemented to promote fish passage and habitat. Little Summit Creek is scheduled to have an undersized culvert replaced in the summer of 2004 that would minimize the loss of pool habitat up and downstream of the existing culvert. Cattle exclosures on Little Summit Creek, Happy Camp Creek, Big Springs, Toggle Meadow, and Derr Meadow have been put in place to protect streams and current habitat, such as pools.

Implementation of Alternative 1 would have no impact on the overall interior redband trout population and would not complete additional projects designed to improving the population status in the Deep Creek Watershed.

Alternative 2 - Proposed Action

Direct and Indirect Effects: Pools per lineal stream mile would be improved and increased within the project streams. Channel reconstruction on approximately 0.25 miles of lower Deep Creek and 0.25 miles on Happy Camp Creeks would directly result in 30 more pools than what currently exists. Because channel reconstruction would be done over relatively small stream segments when compared to overall stream miles within the watershed, average pool frequency within the Deep Creek Watershed would increase slightly to 66 pools per mile upon implementation. Other activities such as large wood placement, headcut repairs, exclosures, and cutbank revetments would stabilize stream pattern, profile, and dimension and provide more quality pools per mile as the channel adjusts over the next 5 to 10 years. It is expected that these activities could reduce stream degradation and increase pool frequency by as much as 15% within 5 years of implementation. This would result in an average of 75 pools per mile. Approximately 55% of stream reaches would still not meet management objectives, however, this value would continue to decrease over time. Increasing the number of pools per mile would benefit redband trout by providing increased habitat complexity and diversity. Increases in pool habitat would

enable more redband trout to survive floods or drought. Use of wood for channel reconstruction would greatly increase the amount of debris dams essential for nutrient storage and increase invertebrate abundance (Smock et al. 1989). Increases in invertebrates would provide a food base for redband trout (Becker 1983).

***Cumulative Effects**:* There would be a beneficial cumulative effect to redband trout pool habitat with the implementation of Alternative 2 and other current and foreseeable projects within the Deep Creek Watershed. Approximately 300 acres of cattle exclosures have been implemented, headcuts have been repaired, and several culverts replaced. These activities will increase pool frequency over time. The Deep Vegetation Management EIS would address some water quality source problems as discussed under the cumulative effects of Alternative 1. The Westside Allotment analysis is expected to further benefit stream health and pool frequency from reducing vegetation utilization and streambank disturbance. These projects all benefit redband trout in this system by cumulatively protecting and rehabilitating instream and riparian habitat. Implementation of design elements would prevent adverse impacts to redband trout. Alternative 2 may impact individuals but would not jeopardize the interior redband trout population and lead towards listing in the short term. Including all reasonably foreseeable projects, including Alternative 2, pool frequency would be expected to increase by as much as 20% within 5 years of implementation. This would result in approximately 80 pools per mile on average.

Alternative 3

Direct and Indirect Effects: Pools per lineal stream mile would be improved and increased within the project streams. Channel reconstruction on approximately 0.25 miles of Happy Camp Creek, would directly increase the number of pools by approximately 15. Fisheries habitat enhancement on lower Deep Creek would increase pools by approximately 8. These immediate changes in pool frequency would not be enough to change the average pool frequency within the watershed from 65 pools per mile. However, other activities such as large wood placement, headcut repairs, exclosures, a riparian pasture, and cutbank revetments would stabilize stream pattern, profile, and dimension and provide more quality pools per mile as the channel adjusts over time. It is expected that these activities could reduce stream degradation and increase pool frequency by as much as 10% within 5 years of implementation (5% less than Alternative 2). This would result in an average of 71 pools per mile (4 less pools per mile than Alternative 2). Approximately 60% of stream reaches would not meet objective levels, however, this value would continue to decrease over time. Increasing the number of pools per mile would benefit redband trout by increasing habitat complexity and diversity. Increases in pool habitat would allow for greater survivability for redband trout during floods or drought. Use of wood for channel reconstruction would greatly increase the amount of debris dams essential for nutrient storage and increase invertebrate abundance (Smock et al. 1989). Increases in invertebrates would provide a food base for redband trout (Becker 1983).

***Cumulative Effects*:** There would be a beneficial cumulative effect to fisheries pool habitat with the implementation of Alternative 3 and other current and foreseeable projects within the Deep Creek Watershed. As discussed in the cumulative effects sections of Alternatives 1 and 2, the Deep Vegetation Management EIS, Westside Allotment analysis, and AMP updates would address water quality problems and how to improve stream conditions. These projects cumulatively benefit fisheries by protecting and rehabilitating instream and riparian habitat. Alternative 3 may impact individuals but would not jeopardize the interior redband trout population and lead towards listing in the short term. Long-term beneficial effects would be expected from this alternative. Cumulatively, Alternative 3 would have less beneficial effects to pool frequency than Alternative 2, but more than Alternative 1. Pool frequency would be

expected to increase by as much as 15% within 5 years of implementation of all projects. This would result in approximately 75 pools per mile on average within the watershed.

Fisheries Measure #2 – Width to Depth Ratios (% of stream miles outside the Objective level)

Existing Condition

Widths to depth ratios are defined as the average stream (water only) width divided by the average depth. Width and depth are important for assessing water quality and fisheries habitat. Wider, shallower streams generally heat up faster and have less pool habitat than narrow and deeper streams (Hawkins et al 1998).

Widths to depth ratios were measured as a percentage of the miles of stream reaches that exceeded the guideline objective level. Riparian Management Objectives (RMOs) within INFISH (USDA and USDI, 1995) recommend that width to depth ratios be less than 10 for all stream systems. This interim guideline was used for reference in this analysis. However, it should be noted that width to depth ratios generally vary by stream type (Rosgen, 1996). Many streams within the Deep Creek Watershed exceed the width to depth ratios expected for the stream type. The width to depth ratios of 60 percent of the miles that were surveyed are below the Management Objective width to depth ratio of 10.

Environmental Effects

Alternative 1 - No Action

Direct and Indirect Effects: The width to depth ratios of 60 percent of the miles that have been surveyed would remain outside the Management Objective level for width to depth ratios of 10. These streams would have ratios greater than desired to meet a properly functioning system. Grazing by wild and domestic ungulates would continue to trample banks and reduce vegetative cover, reducing the streams ability to resist lateral scour. Increased exposure to sunlight, reduced effective shade, and reduced water depth would all reduce habitat for juvenile and adult redband trout. This alternative would have no adverse impact on the overall interior redband trout population, however would do nothing to improve width to depth conditions for redband trout.

Cumulative Effects: Implementing Alternative 1 would not have an adverse cumulative effect to width to depth ratios and redband trout with other current and foreseeable projects in the Deep Creek Watershed. However, width to depth ratios would continue to be below interim guidelines as identified in the Deep Creek Watershed Analysis (USFS 1999) and in the Deep Water Quality Restoration Plan (USFS 2001). By not implementing projects that would correct issues pertaining to poor water quality the Forest Service would not meet the goals and objectives outlined by the LRMP, DEQ, INFISH, Deep Creek Watershed Analysis, and the Deep WQRP. Foreseeable projects within the Deep Vegetation Management EIS would help move stream conditions towards recovery and lower width to depth ratios. Activities such as riparian planting 28 miles, placing large wood over 7.4 miles, rehabilitating 6 dispersed recreation sites, replacing 8 culverts, enhancing 825 acres of meadows, closing 16.2 miles of road, and decommissioning 15.2 miles of road would lead to improved stream conditions over time. Width to depth rations would be expected to improve as stream conditions improve.

The Westside Allotments analysis is expected to address current impacts of grazing. Updates to AMPs within the watershed would be expected to improve width to depth ratios over time and further reduce the effects to streambanks and riparian vegetation.

Past activities such as headcut repairs in Derr Meadow, Timothy Meadow, and Happy Camp Creek have been implemented to minimize the loss of streambanks and existing habitat. In addition culvert replacements on Buck Hollow and Happy Camp Creeks have been implemented to stabilize streams. Little Summit Creek is scheduled to have an undersized culvert replaced in the summer of 2004. Cattle exclosures on Little Summit Creek, Happy Camp Creek, Big Springs, Toggle Meadow, and Derr Meadow have been put in place to protect stream characteristics, such as width to depth ratios.

Implementation of Alternative 1 would have no impact on the overall redband trout population and width to depth ratio. By selecting this alternative, width to depth ratios would not improve as a result of this project. It is expected that other projects within the watershed would result in 57% of the stream miles surveyed to remain in exceeding of the objective level of 10. This is down from the existing value of 60%.

Alternative 2 - Proposed Action

Direct and Indirect Effects: Alternative 2 would directly improve the width to depth ratios on 0.50 miles of channel along Deep and Happy Camp Creeks through channel reconstruction. However, other activities such as large wood placement, headcut repairs, exclosures, and cutbank revetments would stabilize stream pattern, profile, and dimension and would concentrate on lowering width to depth ratios over the long term (>5 years). It is expected that these activities would reduce stream degradation and increase channel building processes through fluvial deposition so that width to depth ratios would stabilize. Within 5 years of implementation of this alternative it would be expected that 38% of the stream miles surveyed would remain outside the Management Objective level for width to depth ratios of 10. This is down from the existing value of 60%. Reducing the width to depth ratios would provide more available habitat for fish. Riffle depth can prevent movement between pools during low flows, essentially isolating fish in pools during summer months (Power et al. 1988).

Cumulative Effects: Cumulative beneficial effects to width to depth ratios and redband trout would be expected with the implementation of Alternative 2 and previously identified watershed projects. As discussed in the previous cumulative effects section, there are several projects that would benefit channel function and width to depth ratios by allowing recovery of riparian vegetation and fluvial deposition for building of streambanks. Design elements would prevent sedimentation and adverse impacts to redband trout. Alternative 2 may impact individuals but would not jeopardize the interior redband trout population and lead towards listing in the short-term. Considering all previously mentioned past, present and foreseeable projects this alternative would have long term benefits to width to depth ratios and fish habit. Streams are expected to have a higher percentage of riparian vegetation, which would result in streambank building through sediment deposition. It is expected that approximately 35% of the stream miles surveyed would remain outside the Management Objective level for width to depth ratios. This is down from the cumulative value in Alternative 1 of 57%.

Alternative 3

Direct and Indirect Effects: Alternative 3 would improve the width to depth ratios of 0.25 miles of channel along Happy Camp Creek through channel reconstruction. Large wood placement

would promote bank stabilization as in Alternative 2. Large wood placement, cutbank revetments, exclosures, a riparian pasture, and headcut repairs would allow streams to rebuild streambanks to improve width to depth ratios. Within 5 years of implementation of this alternative it would be expected that 45% of the stream miles surveyed would remain outside the Management Objective level for width to depth ratios of 10. This is up from the 38% value in Alternative 2, but down from the 60% in Alternative 1. These projects would improve the width to depth ratios and reduce isolation occurring in redband trout habitat, reducing the magnitude of diurnal and seasonal water temperature increases. Reducing the width to depth ratios would also provide more available habitat for fish than current conditions.

***Cumulative Effects**:* Cumulative beneficial effects to width to depth ratios and redband trout would be expected from the implementation of Alternative 3 and other watershed projects discussed under the previous cumulative effects sections. Channel restoration, large wood placement, cutbank revetments, and repairing headcuts would further benefit redband trout populations and habitat in association with those projects already implemented. Design elements would prevent significant adverse impacts to redband trout. Alternative 3 may impact individuals but would not jeopardize the interior redband trout population and lead towards listing in the short-term. Considering all past, present, and foreseeable projects this alternative would have long term benefits to width to depth ratios and fish habit. It is expected that approximately 42% of the stream miles surveyed would remain outside the Management Objective level for width to depth ratios of 10. This alternative cumulatively reduces the percentage of miles outside the Management Objective level by 26%.

Both Alternatives 2 and 3 would have beneficial effects to width to depth ratios and redband populations over the long term. Both alternatives are expected to provide conditions for recovering riparian vegetation and stream function. Alternative 2 would do more to promote stable width to depth ratios than both Alternatives 1 and 3. Alternative 3 would stabilize and build upon existing width to depth ratios more than Alternative 1.

Fisheries Measure #3 – Miles of Available Suitable Habitat Availability

Existing Condition

Upstream fish habitat can be unavailable for use due to downstream barriers. These downstream barriers can be undersized culverts, jumps (large drops) at the outlet (downstream) end of culverts, and/or headcuts that have jumps. Barriers to upstream habitat reduce the effectiveness of the watershed acres, important in determining fish populations (Houslet and Riehle, 1998). Without full habitat availability, optimum fish populations cannot be achieved. Lanka et al. (1987) found that drainage density and basin area correlated with trout population levels for forest and rangeland streams.

Currently, there are approximately 36 known culverts that are considered fish barriers. Most of these culverts are undersized (where water velocity is increased through the culvert), with jumps at the outlet end. There are approximately 120 known headcuts preventing fish passage to upstream habitat. Some of the habitats above these barriers have isolated fish populations, however the habitats are no longer accessible to downstream fish populations. Current fish barriers (headcuts and culverts) have isolated approximately 20 miles of upstream fisheries habitat. Refer to the Deep Vegetation Management EIS (2004), Deep Watershed Analysis (1999a), and the Deep Water Quality Restoration Plan (2001) for a further explanation of channel conditions and effects to redband trout habitat.

Environmental Effects

Alternative 1 - No Action

Direct and Indirect Effects: Miles of habitat availability would not change with implementation of this alternative. Headcuts that are presently preventing upstream access by fish would continue as barriers during low flow and, if large enough, impassable during higher flows. Culverts that are undersized and/or have large outlet jumps would remain impassable to juvenile fish. Without full habitat availability, optimum fish populations would not be achieved and fish populations would not be recovered or stabilized. Under this alternative, habitat availability would continue to be limited by 20 miles.

Cumulative Effects: Implementing Alternative 1 would not have a cumulative effect to redband trout and habitat when consideration of other previously mentioned past, current, and foreseeable projects in the Deep Creek Watershed. Habitat would continue to be limited as identified in the Deep Creek Watershed Analysis (USFS 1999) and in the Deep Water Quality Restoration Plan (USFS 2001). By not implementing projects that would correct issues pertaining to poor water quality the USFS would not be meeting the goals and objectives outlined by the LRMP, DEQ, INFISH, the Deep Creek Watershed Analysis, and the Deep WQRP. Foreseeable projects within the Deep Vegetation Management EIS would help move stream conditions towards recovery and additional available habitat. Activities such as replacing 8 culverts and decommissioning 15.2 miles of road proposed in the Deep EIS would help eliminate known fish barriers.

The Westside Allotment analysis will address possible changes to Allotment Management Plans (AMP) that would benefit stream health and minimize the possibility of headcut development (fish barriers). Outcomes are expected to address grazing and how best to manage those resources that are affected by grazing.

Past activities such as headcut repairs in Derr Meadow, Timothy Meadow, and Happy Camp Creek have been implemented to promote fish passage. In addition culvert replacements on Buck Hollow and Happy Camp Creeks have been implemented to promote fish passage. Little Summit Creek is scheduled to have an undersized culvert replaced in the summer of 2004 that would also promote fish passage. These projects have/will restore fisheries access to upstream habitat.

There are currently no measurable adverse effects to fisheries habitat from the Summit Timber Sale/Prescribed burning or from the Deep Salvage Sale.

Implementation of Alternative 1 would have no impact on the overall interior redband trout population, but would not lead to improving the population status in the Deep Creek Watershed by improving habitat availability.

Alternative 2 - Proposed Action

Direct and Indirect Effects: Alternative 2 would repair 44 headcut complexes, resize 33 culverts and replace 3 culverts with rock fords. These improvements would reestablish access to nearly 20 miles of upstream habitat within the Deep Creek Watershed. Increased habitat availability would beneficially effect redband trout populations by allowing increased habitat to be filled with redband fish. Improving access to habitat would improve habitat availability through a greater percentage of the watershed than is currently available.

Cumulative Effects: The cumulative effects are beneficial to redband trout habitat and populations with the implementation of Alternative 2 and other projects that are scheduled within the Deep Creek Watershed. Those projects discussed under Alternative 1 cumulative effects have/would benefit fisheries and habitat accessibility. Alternative 2 may impact individuals but would not jeopardize the interior redband trout population and lead towards listing, because when combined with other past projects, this alternative would reestablish access to over 20 miles of additional upstream habitat within the watershed.

Alternative 3

Direct and Indirect Effects: Alternative 3 would repair 37 headcut complexes and resize 32 culverts and replace 3 culverts with rock fords within in the Deep Creek Watershed. These improvements would provide access to approximately 15 miles of intermittent and perennial stream habitat in the Deep Creek Watershed. Increased habitat availability would beneficially effect redband trout populations by allowing increased habitat to be filled as fish populations increase. Improving access to habitat would improve habitat availability through a greater percentage of the watershed than is currently available.

Cumulative Effects: The cumulative effects would be beneficial to redband trout habitat and populations with the implementation of Alternative 3 and other projects that are scheduled within the Deep Creek Watershed. Those projects discussed under Alternative 1 cumulative effects have/would benefit fisheries and habitat accessibility. Alternative 3 may impact individuals but would not jeopardize the interior redband trout population and lead towards listing, because when combined with other past projects, this alternative would reestablish access to approximately 17 miles of additional upstream habitat within the watershed.

Issue 2: Water Quality

Water Quality Measure #1 – Sediment Yield/Turbidity

Existing Condition

Section 303(d) of the 1973 Clean Water Act requires each state to set water quality standards and identify those water bodies that are "water quality limited" or "impaired." Turbidity levels must not cumulatively increase by more than 10 percent, measured relative to an upstream control point of the turbidity causing activities (Oregon water quality standards). The Forest Plan indicates that this will be accomplished by maintaining stream bank stability and implementation of Best Management Practices (BMPs). The Forest Plan and INFISH (1995) state that stream bank disturbance should not exceed an average of 20 percent for any given stream drainage.

Sediment yield is the amount of sediment that is transported from the adjacent uplands to the active stream channel. Sediment yield is generally measured in tons per year. Excessive sediment yield may fill streambed spaces, reduce stream depth and widen channels, damage fish gills, and lower egg development and fry (young fish) emergence (Lewis 1998).

Turbidity is suspended sediment, materials that do not readily fall out of suspension from the water column. These materials may inhibit fisheries viability if they are high for a long period of time. In general, turbidity and sedimentation are primarily influenced by erosion due to wildfire, roads, culverts, timber harvest, and cattle grazing. Natural channel stability is achieved by allowing stream systems to develop a stable dimension, pattern, and profile such that, over time,

channel features are maintained and the stream system neither fills and raises the stream bed channel nor degrades the channel (Rosgen 1996).

The Deep Watershed Analysis (1999a) estimates that as much as 30 percent of watershed sediment load comes from bank and channel erosion. Approximately 13 percent of the stream reaches have greater than 20 percent bank instability and 55 percent have 10 to 20 percent bank instability (Deep Watershed Analysis, 1999a). Bank and channel erosion have been attributed primarily to road construction, undersized culverts, loss of streamside vegetation, recreation, and cattle grazing. In the past approximately 10 undersized culverts have been plugged and have diverted flows onto road surfaces, thus eroding sediment into the stream.

Approximately 10 percent of the streams in the watershed are inherently high in sediment due to local soil types and geology. Stream bank instability, other activities known to produce and deliver sediment and inherently high sedimentation levels indicate that sediment is above historic levels. There are no 303(d) Listed streams for sedimentation/turbidity within the Deep Creek Watershed.

Current sediment yield has been evaluated with the Water Erosion Prediction Project (WEPP) Model in tons per year over a 30-year average, or tons per acre per year over a 30-year average. Sediment yield values give indication as to sedimentation and turbidity levels. Current estimated sediment yields are as follows:

- 14.09 tons per year from proposed headcut repair sites
- 9.87 tons per year from proposed cutbank revetment sites
- 4.38 tons per year from proposed road treatment sites
- 0.05 tons per acre per year from proposed spring development sites
- 0.35 tons per year from proposed channel reconstruction sites
- 0.05 tons per acre per year from large wood placement sites
- 0.05 tons per acre per year from proposed exclosure sites
- 22.90 tons per year from proposed riparian pasture site
- 1 ton per year from proposed culvert replacement sites

Environmental Effects

Alternative 1 - No Action

Direct and Indirect Effects: Alternative 1 would result in continued degradation of the Deep Creek Watershed. Sediment yield would continue to degrade water quality and fisheries. Risk of large-scale sediment inputs would continue to exist. Roads identified as high aquatic concern due to water quality degradation would not be reconstructed, closed, or decommissioned. Current sediment yield from identified roads would continue at current levels (4.38 tons per year).

Sediment yield levels from 36 identified undersized culverts would continue to contribute at least one ton of sediment to streams per year. Undersized culverts would continue to increase water velocities and scour the streambed and transport sediment at the outlet end. The risk for large-scale sediment input from road failure due to plugged, undersized culverts would continue to exist.

Lack of vegetative cover in site-specific riparian areas would continue to allow increased sediment into streams and degrade water quality. Cattle would continue to concentrate and utilize

streamside vegetation in preferred areas resulting in post-holing, trailing, and bank sloughing. Cutbank disturbance would continue to expose lateral banks and outside meander bends. Exposed cutbanks would continue to contribute sediment on an annual basis.

Segments of Happy Camp Creek would continue to have unstable pattern, profile, and dimension. Sediment would continue to be delivered into the stream as several headcuts continue upstream movement through an existing meadow. The existing meadow would continue to be at risk for vegetative change as the water table drops.

Headcuts would continue to move upstream, scouring down, and lowering the water table. Lowering the water table would result in a shift of riparian vegetation to a drier species composition. The result would be a reduction in effective ground cover leading to increased levels of soil erosion during high water flow events.

There would be no long-term (greater than 2 years) sediment benefits to the watershed through proactive treatments. Short-term (less than 2 years) increases in sediment yield from proactive treatments would not occur. Continued erosion could lead to a violation of state water quality standards in any given year.

Cumulative Effects: Past and present management activities such as domestic livestock grazing (sheep and cattle), timber harvest, fire suppression, road building and recreation have contributed to degraded riparian conditions, increased soil erosion, and subsequently higher sediment yields.

Current and past stream restoration activities have occurred within the watershed since 1990. These restoration activities include culvert replacements, riparian planting, road closures, large wood placement, headcut restoration, spring development, and construction of livestock exclosure fences. Culvert replacements have occurred on Happy Camp Creek and Buck Hollow Creek to decrease sediment yield and promote fish passage. Little Summit Creek is scheduled to have an undersized culvert replaced in the summer of 2004 that would reduce channel scour. Headcut restoration has occurred in Happy Camp Creek, Timothy Meadow, and Derr Creek. Headcut restoration has stopped the advancement of headcuts, providing some local reduction in erosion rates and sediment yield. Spring development projects such as Double Corral Spring (Derr Allotment) have drawn cattle away from riparian areas to improve cattle distribution thereby maintaining and/or improving effective ground cover for the protection of soil resources. Cattle exclosures on Little Summit Creek, Happy Camp Creek, Big Springs, Toggle Meadow, and Derr Meadow have been put in place to protect streams and reduce sediment yield.

The Westside Allotment analysis is currently ongoing and could result in changes to Allotment Management Plans (AMPs) that would benefit stream health and minimize sediment yield within the watershed. Outcomes are expected to address grazing and how best to manage those resources that are affected by grazing. This project is expected to be completed in 2004. The development of these AMP updates will recognize the dynamics between livestock seasonal usage (flexibility with traditional turn-on and turn-off dates), livestock distribution (variation of utilization between upland and riparian habitats), and livestock numbers (development of Animal Unit Months based on management objectives for riparian and upland range areas). The new AMPs are expected to improve riparian conditions and reduce soil erosion and sediment yield.

Foreseeable projects within the Deep Vegetation Management EIS would help move stream conditions towards recovery. Many of these activities such as riparian planting 28 miles, placing large wood over 7.4 miles, rehabilitating 6 dispersed recreation sites, replacing 8 culverts, enhancing 825 acres of meadows, closing 16.2 miles of road, and decommissioning 15.2 miles of

road would all lead to improved stream conditions and lower sediment yield values over time. It is estimated that these activities could reduce sediment yield values by as much as 15% within five years after implementation.

There are currently no measurable adverse effects to water quality due to sediment yield from the Summit Timber Sale/Prescribed burning or from the Deep Salvage Sale. When including all past harvest activities, the Equivalent Harvest Area Model shows values are approximately 20%, which are below the designated threshold level of 25% for the Deep Creek Watershed (Deep EIS, 2004).

Implementation of Alternative 1 would not have a cumulative effect to sediment yield. However, sediment yield would not be minimized through proactive treatments. Sediment yield would continue to be a problem as identified in the Deep Creek Watershed Analysis (USFS 1999) and in the Deep Water Quality Restoration Plan (USFS 2001). By not implementing projects that would correct issues pertaining to poor water quality the USFS would not be meeting the goals and objectives outlined by the LRMP, DEQ, INFISH, the Deep Creek Watershed Analysis, and the Deep WQRP.

When considering all past, present, and foreseeable activities, Alternative 1 would continue to result in degradation of the Deep Creek Watershed over the short (<2yrs) and long term (>2yrs). Past and foreseeable projects would reduce sediment yield, but degradation would outweigh any beneficial treatements to the watershed. Streams within the watershed would continue to erode and degrade.

Alternative 2 - Proposed Action

Direct and Indirect Effects: This alternative would focus on repairing those areas that have been identified as the major sediment yield contributors. There is expected to be some short-term (<2yrs) relatively small inputs of sediment from working near/in streams. However, long-term benefits would greatly outweigh any short-term consequences. This alternative would implement many activities to reduce sediment yield, unlike Alternative 1. The Jackson Creek and Little Summit Prairie Creek Subwatersheds are at high risk to producing large amounts of sediment in any given year, of which this alternative would lessen the potential. This alternative would reduce sediment yield to streams by approximately 37 tons per year (WEPP).

Cutbank disturbance would be considerably less than present in this alternative with the implementation of headcut repairs, cutbank revetments, spring developments, large wood placement, and exclosures.

This alternative would reduce sediment yield by approximately 3.4 tons from proposed road treatments over time, with the assumption of vegetative recovery. Little Summit, Thornton, Jackson, Happy Camp, and Crazy Creeks would benefit the most from these road treatments.

Identified problematic culverts would be replaced within this alternative. Current sediment yield levels from identified problematic culverts would be reduced by approximately 1 ton. In the past approximately 10 undersized culverts have been plugged and have diverted flows onto road surfaces, eroding sediment into the stream. Replacing undersized culverts would decrease water velocities and decrease scour and transport sediment at the outlet end. The risk for large-scale sediment input from road failure due to plugged undersized culverts would decrease. Undersized culverts would no longer continue to be fish barriers, but would promote fish passage to upstream habitat. All streams within the watershed would benefit from this activity.

Under Alternative 2 three cattle exclosures and five spring developments would be implemented. Also 2.9 miles of large wood placement would occur to discourage utilization along riparian areas that have been altered and are contributing sediment into streams. Large wood would also trap sediment and aid in rebuilding stream banks. These activities would promote vegetation recovery and bank stabilization, thus decreasing the potential for further sediment input to the streams. With the assumption of vegetative recovery in these identified locations, WEPP estimates that sediment yield to streams would be non-measurable from these sites.

Cutbank revetments would be implemented to reduce lateral scour on outside meander bends. Exposed cutbanks would no longer contribute as much sediment on an annual basis. It is expected that localized sediment levels would increase immediately upon digging and upon the first peak flow. However there would be a long-term (>2yrs) reduction in sediment yield and sediment transport would be minimized, as instream work would be during low flow conditions. Revetment material would add bank roughness and prevent lateral scour. This alternative would reduce sediment yield by 9.87 tons per year with the establishment of vegetation and revetments (WEPP).

In addition to cutbank revetments, two channel reconstructions would occur to stabilize stream pattern, profile, and dimension, minimize sediment yield, and provide fish habitat. The channel reconstruction site on Happy Camp Creek would reduce sediment delivery into the stream by stopping the advancement of several headcuts that are working their way upstream through an existing meadow. Reconstructing a new channel would reconnect the stream with the floodplain and allow the re-establishment of a higher watertable. The existing meadow is at risk as the watertable drops with the headcuts. Headcuts within this proposed project area on Happy Camp Creek are 3 to 6 feet deep and migrating upstream. Sediment delivery is expected to decrease with this proposed project by approximately 0.35 tons per year, however, there would be some localized sediment delivery upon digging a new channel and routing water through. Long-term (>2yrs) sediment delivery would be less, as headcuts would be by-passed, and a stable channel would be built. Sediment yield is not expected to decrease on the lower Deep Creek site, as the current channel is stable. This project would primarily be for fish habitat and would have some short-term increases in sediment.

Headcut repairs would occur on 44 complexes. Headcut stabilization would require digging within active stream channels. It is expected that localized sediment levels would increase immediately upon digging and upon the first peak flow. However, sediment transport would be minimized as instream work would be completed during low flow conditions. There would be short-term increases in sediment, but sediment yield would be much lower over the long term (>2yrs) as the headcuts would be stabilized. This alternative would reduce sediment yield by 14.09 tons per year.

Cumulative Effects: As previously described under Alternative 1 cumulative effects, past and present management activities such as domestic livestock grazing (sheep and cattle), timber harvest, fire suppression, road building and recreation have contributed to degraded riparian conditions, increased soil erosion, and subsequently higher sediment yields.

In addition to the past, present, and foreseeable future actions mentioned in Alternative 1, Alternative 2 would have beneficial cumulative effects to sediment yield in the short term (<2yrs) and long term (>2yrs). All ground disturbing activities in this alternative would initially add a relatively small amount of sediment to streams, however would minimize the tons of sediment yield occurring yearly across the watershed due to past management activities. Cumulatively, this alternative would reduce sediment yield over the short and long term, of which Alternative 1

would not.

Alternative 3

Direct and Indirect Effects: This alternative would focus on repairing those areas that have been identified as major sediment yield contributors. There is expected to be some short-term (<2yrs) relatively small inputs of sediment from working near or in the stream. However, long-term benefits would greatly outweigh any short-term consequences. This alternative would implement many activities to reduce sediment yield, unlike Alternative 1. In some treatments (roads, riparian pasture, exclosures, large wood placement, and spring developments) this alternative does more to prevent sediment input over Alternative 2. In other treatments (cutbank revetments and headcut complexes) this alternative does less to prevent sediment input over Alternative 2. Overall, Alternative 3 would decrease sediment yield by approximately 56 tons per year (WEPP) compared to 37 tons in Alternative 2.

Cutbank disturbance would be considerably less than present in this alternative with the implementation of headcut repairs, cutbank revetments, spring developments, large wood placement, exclosures, and a riparian pasture. Cutbank disturbance would be similar between Alternatives 2 and 3.

The roads identified for treatment within this alternative currently produce an average of 4.38 tons of sediment to streams per year (WEPP). Treating these roads would reduce this value over time. This alternative would reduce road related sediment yield by approximately 1 ton per year over Alternative 2 (by decommissioning 12 more miles), and 4.38 tons over Alternative 1.

A total of 32 identified problematic culverts would be replaced within this alternative (one less than Alternative 2). Additionally, 3 culverts would be replaced with rock fords (same as Alternative 2). Replacing culverts within this alternative would reduce sediment yield by approximately 1 ton per year.

Under this alternative four cattle exclosures (one more than Alternative 2) and seven spring developments (2 more than Alternative 2) would be implemented. These treatments would discourage cattle utilization along riparian areas that have been altered and are contributing sediment into streams. Also 3.6 miles of large wood placement (0.7 miles more than Alternative 2) would occur to discourage utilization along riparian areas and to trap suspended sediment. These activities would promote vegetation recovery and bank stabilization, thus decreasing the potential for further sediment input to streams. Considering only these treatments, this alternative does more to reduce sediment yield than Alternatives 1 and 2. Assuming vegetative recovery in these areas, sediment yield would be non-measurable (WEPP).

One riparian pasture on lower Deep Creek would be built in this alternative. This pasture would promote vegetation recovery and bank stabilization, thus decreasing the potential for further sediment input to the streams. This particular area is of great concern for sediment input due to exposed cutbanks and lack of vegetative cover. This activity would allow controlled use of this area, which would not occur in Alternatives 1 or 2. Assuming vegetative recovery, this riparian pasture would reduce sediment yield to streams by 20.82 tons (WEPP).

A total of 18 cutbank revetments (14 less than Alternative 2) would be implemented to reduce lateral scour on outside meander bends. Exposed cutbanks would no longer contribute as much sediment on an annual basis, but would continue to add more sediment than Alternative 2 from cutbanks (Table 9 on page 47). It is expected that localized sediment levels would increase

immediately upon digging and upon the first peak flow. However there would be a long-term (>2yrs) reduction in sediment yield and sediment transport would be minimized, as instream work would be completed during low flow conditions. Revetment material would add bank roughness and prevent lateral scour. Current sediment yield from identified cutbanks is greater than 9.87 tons per year. This alternative would reduce sediment yield by 6.67 tons with the establishment of vegetation and revetments. Considering only this treatment, this alternative does less to reduce sediment yield than Alternative 2, but more than Alternative 1.

One channel reconstruction project would occur in the upper reaches of Happy Camp Creek. This project would stabilize stream pattern, profile, and dimension and minimize sediment yield. Headcuts within this proposed area on Happy Camp Creek are 3 to 6 feet deep and are migrating upstream. The channel reconstruction site on Happy Camp Creek would reduce sediment delivery into the stream by stopping the advancement of several headcuts that are working their way upstream through an existing meadow. The existing meadow is at risk as the watertable drops with the headcuts. Sediment delivery is expected to decrease with this proposed project by 0.25 tons (excluding headcuts and cutbanks), however there would be some localized sediment delivery upon digging a new channel and routing water through. Long-term (>2yrs) sediment delivery is expected to be less, as headcuts will be by-passed, and a stable channel will be built. There would be no change in sediment effects by dropping the Deep channel reconstruction. This project would primarily be for fish habitat and would have some short-term increases in sediment. Under this alternative a channel reach on lower Deep Creek would be treated to enhance fisheries and water quality. This activity would put a relatively small amount of sediment into the stream in the short term (<2yrs). Long-term benefits would primarily be for fish habitat.

Headcut repairs would occur on 37 complexes (7 less than Alternative 2). Headcut stabilization would require digging within active stream channels. It is expected that localized sediment yield levels would increase immediately upon digging and upon the first peak flow. However, sediment transport would be minimized, as instream work would be completed during low flow conditions. There would be short-term increases in sediment, but sediment yield would be much lower over the long term (>2yrs) as headcuts stabilize. This alternative would reduce sediment yield by 12.11 tons per year (WEPP).

Cumulative Effects: The cumulative effects of Alternative 3 are similar to those described in Alternative 2. This alternative would have beneficial cumulative effects on sediment yield in the short term (<2yrs) and long term (>2yrs). All ground disturbing activities in this alternative would initially add a relatively small amount of sediment to streams, however it would minimize the tons of sediment yield that are cumulatively occurring yearly across the watershed due to past management activities. Alternative 3 would reduce sediment yield to a larger extent than Alternative 2 (Table 9 on page 47).

Table 9 – Rates of Sediment Yield by Activity by Alternative.

Activity	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3
Headcut Repairs	≥ 14 tons/yr	Reduced by 14 tons/yr	Reduced by 12 tons/yr
Cutbank Revetments	≥ 10 tons/yr	Reduced by 10 tons/yr	Reduced by 7 tons/yr
Channel Reconstruction[#]	≥ 0.5 tons/yr	Reduced by 0.5 tons/yr	Reduced by 0.25 tons/yr
Fish Habitat Enhancement	NA	NA	Short-term Increase (<2yr)
Culverts	≥ 1-2 tons/yr	Reduced by 1 ton/yr	Reduced by 1 ton/yr
Road Treatments	≥ 4 tons/yr	Reduced by 3.5 tons/yr *	Reduced by 4 tons/yr*
Exclosures:	0.05 tons/acre/yr	Reduced by 9 tons/yr *	Reduced by 11 tons/yr *
Riparian Pastures	23 tons/yr	23 tons/yr	Reduced by 21 tons/yr*
Large Wood Placement	0.05 tons/acre/yr	Rate of 0 tons/acre/yr *	Rate of 0 tons/acre/yr*
Spring Developments	0.05 tons/acre/yr	Rate of 0 tons/acre/yr *	Rate of 0 tons/acre/yr*
TOTAL	**>53 tons/yr**	**Reduced by 38 tons/yr**	**Reduced by 56 tons/yr**

[#] These values do not include sediment yield from headcuts within the proposed reconstruction area(s).
* Rates assume recovery of surrounding vegetation.

Water Quality Measure #2 – Stream Temperature/Shade

Existing Condition

The dominant source of heat input to streams is from direct solar radiation. It has been shown that channels with greater surface areas (high width to depth ratios) will heat faster than streams that are narrower and deeper (Brown 1972). Section 303(d) of the 1973 Clean Water Act requires each state to set water quality standards and identify those water bodies that are "water quality limited" or "impaired". The State standard for stream temperature stipulates that the average of the daily maximum stream temperature during any seven consecutive days shall not exceed 64^{o}F (ODEQ 1995). The LRMP also has this standard for stream temperatures. As a surrogate for stream temperature, stream shade can be a useful indicator. The Ochoco LRMP (1989) requires that shade along streams will generally correspond to provisions for more than 80% of the surface shaded. Where this cannot be attained, 100% of the potential for shade is the standard (See the Deep Creek WQRP 2001). The RMOs as established by the Inland Native Fish Strategy (INFISH 1995) recommend that there be no measurable increase in the 7-day moving mean of the daily maximum stream temperatures. Stream temperatures within the Deep Creek Watershed are monitored every summer with data supplied to Oregon Department of Environmental Quality. Stream temperatures are measured in degrees Fahrenheit.

Regular monitoring of stream temperatures during the past decade in the Deep Creek Watershed has established that summer maximum stream temperatures exceed the statutory standard of the State of Oregon in Deep Creek, Crazy Creek, East Fork Crazy Creek, West Fork Crazy Creek, Little Summit Creek, Happy Camp Creek, Jackson Creek, Double Corral Creek, Toggle Creek, and Derr Creek. However, Toggle and Derr Creeks are not currently on the 303(d) List. All of these streams account for approximately 90% of the volume of water in the watershed. Existing shade surveys show that the 80% Forest Standard for shade is not being met in most of the watershed. However, as discussed in the Deep WQRP potential shade values are dependant upon stream type, current vegetation, and past disturbance. Hence 80% shade should not be a standard for all stream types. Shade surveys were taken with a Solar Pathfinder every 100 feet in surveyed streams. Conifers provide most of the shade in the watershed with a smaller degree of shade

provided by shrubby vegetation. In non-forested riparian communities shade producing shrubs are sparse. Refer to the Deep WQRP for more discussion on changes in shade due to changes in vegetation and channel form. Also refer to the Deep EIS and Deep Watershed Analysis for further discussion.

Environmental Effects

Alternative 1 - No Action

Direct and Indirect Effects: Under this alternative, existing land management practices would remain the same. None of the activities referred to in the other action alternatives would occur. This alternative would not provide an opportunity to improve stream temperatures through managing for healthy riparian areas and consequently stream shade.

This alternative would not improve landscape-level health and diversity through water quality improvement projects. Roads currently identified as high aquatic concern would not get fixed, closed, or decommissioned. Roads that are currently parallel and adjacent to streams would continue to exist and prevent the establishment of vegetation, thus inhibiting the establishment of shade producing vegetation. Current road density within 200 feet of streams is 4.12 mi/mi^2 (Deep EIS, 2004) Optimum road density should be no more than 3 mi/mi^2.

Undersized culverts would continue to contribute to changes in channel morphology and may lead to altered channels more susceptible to changes in vegetation due to an elevation change in the water table and consequently less shade. The risk for large-scale sediment input from road failure due to plugged, undersized culverts would continue to exist. Large-scale sediment input could lead to aggradation, higher width to depth ratios, and subsequently higher stream temperatures.

There would be less effort to discourage cattle from areas that are currently contributing to water quality degradation from the loss of shade. Cattle would continue to concentrate and utilize streamside vegetation in their preferred areas resulting in high utilization and loss of shade. Ongoing monitoring of INFISH standards and stubble height would continue to identify problem areas, however no activities would be implemented to resolve those problems.

Cutbank disturbance would continue to cause lateral scour on outside meander bends. Changes in channel morphology would continue, which could lead to increased stream temperatures.

Existing headcuts would continue to degrade pattern, profile, and dimension. Downcutting would lower the water table resulting in a shift of riparian vegetation to a drier species composition. Effective ground cover and shade would be reduced.

Alternative 1 would result in continued degradation to channel conditions influencing stream temperatures within Deep Creek, Crazy Creek, East Fork Crazy Creek, West Fork Crazy Creek, Little Summit Creek, Happy Camp Creek, Jackson Creek, Double Corral Creek, Toggle Creek, and Derr Creek.. There would be no short (<2 yrs) or long-term (>2 yrs) stream temperature benefits to the watershed through proactive treatments. Changes in channel pattern, profile, and dimension would continue to exist, which would prolong stream temperature problems. High stream temperatures would continue to degrade water quality and fisheries habitat. The six streams currently on the 303(d) List would remain on the list.

Cumulative Effects: Past and present management activities such as domestic livestock grazing (sheep and cattle), timber harvest, fire suppression, road building and recreation have contributed to degraded riparian conditions and subsequently higher stream temperatures.

Past grazing practices allowed unrestricted livestock grazing to occur between 1880 and 1907. This resulted in the loss of effective cover and destabilization of banks over time. Nonnative grasses and forbs invaded and now dominate many of these areas. These species invade disturbed sites when the less resilient native plant species decline under grazing pressure. These changes in species composition and structure have degraded the quality of riparian habitat, reducing effective ground cover, shade, and rooting depths. Many native shrub communities along streams have been degraded and have declined in distribution. Regulation of livestock grazing improved in the mid 1900's resulting in improved riparian and stream channel conditions. Consult the Deep Creek WQRP for further discussion.

Current and past stream restoration activities have occurred within the planning area since 1990. These restoration activities include culvert replacements, riparian planting, road closures, large wood placement, headcut restoration, spring development, and construction of livestock exclosure fences. Headcut restoration has occurred in Happy Camp Creek, Timothy Meadow, and Derr Creek. Headcut restoration has stopped the advancement of channel evolution, thus maintaining temperature regimes upstream of the headcut. Spring development projects have and will occur within the planning area. The development of Double Corral Spring (Derr Allotment) has been an attempt to draw cattle away from riparian areas and improve distribution, thereby maintaining or improving effective ground cover and shade. Cattle exclosures on Little Summit Creek, Happy Camp Creek, Big Springs, Toggle Meadow, and Derr Meadow have also moved cattle away from riparian areas.

The Westside Allotment analysis would address the effects on temperature and shade and possible changes to AMPs to benefit stream health and stream temperatures within the watershed. Outcomes are expected to address grazing and how best to manage those resources that are affected by grazing. This project is expected to be completed in 2004. The development of these AMP updates will recognize the dynamics between livestock seasonal usage (flexibility with traditional turn-on and turn-off dates), livestock distribution (variation of utilization between upland and riparian habitats), and livestock numbers (development of Animal Unit Months based on management objectives for riparian and upland range areas). The new AMPs are expected to retain higher levels of grasses and forbs to promote stable streambanks, which would then promote natural recovery of vegetation that is expected to reduce stream temperatures.

Foreseeable projects within the Deep Vegetation Management EIS would help move stream conditions towards recovery. Many of these activities such as riparian planting 28 miles, placing large wood over 7.4 miles, rehabilitating 6 dispersed recreation sites, and enhancing 825 acres of meadows would lead to more shade and lower stream temperatures over time.

There are currently no measurable increased stream temperatures from the Summit Timber Sale/Prescribed burning or from the Deep Salvage Sale. Mitigation to eliminate adverse effects to water quality is discussed under Fisheries cumulative effects. When including all past harvest activities, the Equivalent Harvest Area Model shows values that are approximately 20%, which are below the designated threshold level of 25% for the Deep Creek Watershed (Deep EIS 2004).

Implementation of Alternative 1 would not have an adverse cumulative effect to stream temperatures. However, temperatures would not be minimized through proactive treatments. Stream temperatures would continue to be a problem as identified in the Deep Creek Watershed

Analysis (USFS 1999) and in the Deep Water Quality Restoration Plan (USFS 2001). By not implementing projects that would correct issues pertaining to poor water quality the USFS would not be meeting the goals and objectives outlined by the LRMP, DEQ, INFISH, the Deep Creek Watershed Analysis, and the Deep WQRP.

Alternative 1 would result in continued degradation to stream temperatures in the Deep Creek Watershed over the short (<2yrs) and long term (>2years). Streams within the watershed would continue to be out of equilibrium and would continue to have low shade and high stream temperature values. Past and foreseeable projects would reduce stream temperatures over many years, but degradation would outweigh the past, present, and foreseeable beneficial treatements within the watershed.

Alternative 2 - Proposed Action

Direct and Indirect Effects: This alternative would promote improved stream temperatures over the short and long-term by repairing those areas that are contributing to water quality degradation.

The majority of the roads identified for treatment within this alternative are within 200 feet of a stream. This alternative would decrease the amount of road within 200 feet of streams to below 4 mi/mi^2. Treating these roads would promote vegetation establishment and higher shade values. Short-term benefits to stream temperature from this activity would not be measurable, but over the long-term (>2yrs) temperatures would decrease as vegetation recovers.

Identified problematic culverts would be replaced within this alternative. A total of 33 culverts would be replaced and 3 culverts would be replaced with rock fords. In the past approximately 10 undersized culverts have been plugged and have diverted flows onto road surfaces, eroding sediment into the stream and changing the channel dimensions. Replacing these undersized culverts would decrease the likelihood for changes in channel morphology and stream temperatures. Larger culverts would also create better holding water for fish that would be shaded. Short-term benefits to stream temperature from this activity would not be measurable, but would be beneficial to stream temperatures in the long-term (>2yrs).

Under this alternative, three cattle exclosures, and five spring developments would be completed. These treatments would limit cattle utilization along riparian areas that have been altered and promote vegetation recovery for increased shade. Short-term increases in shade may not be measurable, but long-term (>2yrs) shade values would improve. Also 2.9 miles of large wood placement would occur to discourage utilization along riparian areas that contribute to degraded shade conditions. Large wood would create some shade, trap sediment, and aid in rebuilding channel banks for better shade conditions. Shade conditions would increase immediately upon implementation, but may not be measurable in the short-term.

Cutbank revetments would be implemented to reduce lateral scour on outside meander bends. This activity would reduce the likelihood for changes in channel morphology, and promote a stable channel for producing shade. Cutbank revetments would ultimately provide some localized shade through overhanging rootwads and logs. This activity would provide better shade conditions over the short and long terms.

The channel reconstruction site on Happy Camp Creek would reduce sediment delivery into the stream by stopping the advancement of several headcuts that are working their way upstream through an existing meadow. The existing meadow is at risk of losing all riparian vegetation as the watertable drops with the headcuts. Lowering the water table would result in a shift from

riparian vegetation to a drier species composition. This change in species composition would lead to increased water temperature. Channel reconstruction would occur to stabilize stream pattern, profile, which is necessary to maintain/reduce stream temperatures. Stream temperatures along Happy Camp Creek would be improved over the short and long-term (>2yrs). Stream temperatures are not expected to decrease on the lower Deep Creek site, as the current channel is stable and well shaded.

Headcut repairs would occur on 44 complexes. Treating these headcuts would protect upstream riparian vegetation from being lost and would promote a stable upstream channel that has a watertable capable of supporting riparian vegetation for shade. Stabilizing headcuts would have short and long term benefits to stream temperatures.

Cumulative Effects: As previously mentioned under Alternative 1 cumulative effects, there are several past, present, and foreseeable actions that are aimed at reducing stream temperatures. This alternative would have beneficial cumulative effects to stream temperatures in the short term (<2yrs) and long term (>2yrs). Cumulatively with previously identified restoration projects, this alternative would result in a greater reduction of stream temperatures than Alternative 1.

Alternative 3

Direct and Indirect Effects: From a stream temperature aspect, all activities within Alternative 3 would promote improved stream temperatures over the short and long-term. This alternative would do more to improve stream temperatures than Alternative 1. In some treatments (roads, riparian pasture, exclosures, large wood placement, and spring developments) this alternative does more to promote cooler stream temperatures over Alternative 2. In other treatments (cutbank revetments and headcut complexes) this alternative does less to promote reduced stream temperatures over Alternative 2. Overall, Alternative 3 would provide the highest potential for increased shade conditions and reduced stream temperatures.

The majority of the roads identified for treatment within this alternative are within 200 feet of some stream. This alternative would decrease the amount of road within 200 feet of streams to below 4 mi/mi^2, slightly lower than Alternative 2. Treating these roads would, in some cases, promote vegetation establishment and promote higher shade values. Short-term benefits to stream temperature from this activity would not be measurable, but long-term (>2yrs) temperatures should demonstrate a beneficial trend. This alternative would do more road treatments than Alternative 2, hence would have more benefits to vegetative and shade recovery.

Identified problematic culverts would be replaced within this alternative. A total of 32 culverts (one less than Alternative 2) would be resized and 3 culverts would be replaced with rock fords. Replacing these culverts would decrease the likelihood for changes in channel morphology and stream temperatures. The risk for large-scale sediment input from road failure due to plugged undersized culverts would decrease. Larger culverts would also create better holding water for fish, which would be shaded. Short-term benefits to stream temperature from this activity would not be measurable, but should demonstrate a beneficial trend in the long-term (>2yrs).

Under this alternative four cattle exclosures (one more than Alternative 2) and seven spring developments (2 more than Alternative 2) would be implemented. These treatments would prohibit/discourage cattle utilization along riparian areas that have been altered and promote vegetation recovery for more shade. Short-term increases in shade may not be measurable, but long-term (>2yrs) shade values would improve. Also 3.6 miles of large wood placement (0.7 miles more than Alternative 2) would occur to prohibit utilization along riparian areas that have

been altered and are contributing to degraded shade conditions. Large wood would create some shade and would also trap sediment and aid in rebuilding channel banks for better shade conditions. Shade conditions would increase immediately upon implementation, but may not be measurable in the short-term. These activities would promote vegetation recovery and bank stabilization, thus increasing the potential for vegetation recovery and shade. Considering only these treatments, this alternative does more to promote vegetation recovery for better shading conditions than Alternatives 1 and 2.

One riparian pasture would be built on lower Deep Creek in this alternative. This pasture would promote vegetation recovery and bank stabilization, thus increasing the potential for better shade conditions. This particular area is of great concern for lack of shade due to exposed cutbanks and lack of healthy vegetative cover. This activity would allow controlled use of this area, which would not occur in Alternatives 1 and 2.

A total of 18 cutbank revetments (14 less than Alternative 2) would be implemented to reduce lateral scour on outside meander bends. Exposed cutbanks would no longer contribute as much sediment on an annual basis. Implementing the revetments would reduce the likelihood for changes in channel morphology and promote a stable channel for producing shade. Revetment material would add bank roughness and would immediately provide some localized shade through overhanging rootwads and logs. Considering only this treatment, this alternative does less to provide shade than Alternative 2, but more than Alternative 1.

One channel reconstruction project would occur in the upper reaches of Happy Camp Creek. This project would stabilize stream pattern, profile, and dimension and promote cooler stream temperatures. The existing meadow is at risk to losing all riparian vegetation as the watertable drops with the headcuts. Lowering the water table would result in a shift of riparian vegetation to a drier species composition. Once vegetation is lost, streams would be exposed to direct solar radiation and consequently higher stream temperatures. The result would be a reduction in shade. Channel reconstructions would occur to stabilize stream pattern and profile, which is necessary to maintain/reduce stream temperatures. Stream temperatures along Happy Camp Creek would be improved over the short and long-term (>2yrs).

Headcut repairs would occur on 37 complexes (7 less than Alternative 2). Treating these headcuts would protect upstream riparian vegetation from being lost and would promote a stable upstream channel that has a watertable capable of supporting riparian vegetation for shade. Stabilizing headcuts would have short and long term benefits to stream temperatures.

Under this alternative a channel reach on lower Deep Creek would be treated to enhance fisheries and water quality. This activity would promote cooler stream temperatures on a localized scale over the short and long-term by providing cover with 4-6 fish structures such as log and rock weirs.

***Cumulative Effects**:* As previously mentioned, past and present management activities such as domestic livestock grazing (sheep and cattle), timber harvest, fire suppression, road building and recreation have contributed to degraded riparian conditions, increased soil erosion, and subsequently higher stream temperatures. The cumulative effects of this alternative are similar to those described in Alternative 2. Cumulatively with previously identified restoration projects, this alternative would result in a greater reduction of stream temperatures than Alternatives 1 and 2 over the short and long term.

Issue 3: Soils

Soils Measure #1 – Soil Erosion

Existing Condition

Most detrimental soils effects from animals have occurred from concentrated herds of cattle, horses, and sheep although large game has caused some damage. Much of the damage from bovine/equine livestock occurred before 1900. Overgrazing has caused a loss of effective ground cover, compaction, reduced stream bank stability, increased stream head cutting, post holing (depressions resulting from livestock hooves), and puddling. Compaction has resulted in low water infiltration rates and high levels of sheet/rill and channel erosion. Logging influences were minimal until the introduction of heavy equipment in the 1930s, resulting in much of the acreage below 30 to 40 percent slope being tractor logged. Multiple harvest activities and mechanized fuels treatments have left 30 to 40 percent of the soils in a compacted or displaced condition (Deep EIS 2004). Approximately 692 acres of roads have been removed from the productive soils base. These activities have contributed to degraded riparian conditions, increased soil erosion, higher sediment yields, and lower soil productivity. Ochoco LRMP states erosion is to be limited to a rate that approximates natural processes. Due to channel degradation, erosion rates are not approximating natural processes

Current soil erosion values have been evaluated with the WEPP Model in tons per year over a 30-year average, or tons per acre per year over a 30-year average. Soil erosion values indicate how much sediment is moving on the landscape and that has the potential to reach streams. Current estimated soil erosion values are:

- ≥14 tons per year from proposed headcut repair sites
- ≥10 tons per year from proposed cutbank revetment sites
- ≥35 tons per year from proposed road treatment sites
- 0.07 tons per acre per year from proposed spring development sites
- ≥12 tons per year from proposed channel reconstruction sites
- 0.07 tons per acre per year from large wood placement sites
- 0.07 tons per acre per year from proposed exclosure sites
- 67 tons per year from proposed riparian pasture site
- 1-2 tons per year from proposed culvert replacement sites

Total existing soil erosion within the watershed is estimated at greater than 140 tons per year.

Environmental Effects

Introduction

Soil erosion is the detachment and movement of soil from the land surface by wind, water, or gravity. Increases in soil erosion rates can have impacts on soil productivity and water quality. Disturbed soils on moderate slopes may concentrate overland flows. Models used to estimate potential soil erosion and sediment yield resulting from restoration activities are the WEPP, Universal Soil Loss Equation (USLE), and Relative Erosion Rate Models (Soil Report, Deep Vegetation Management EIS 2004). Effects to the soil resource by the alternatives are measured by soil loss (erosion) in tons/year or tons/acre/year by WEPP.

Alternative 1 - No Action

Direct and Indirect Effects: This alternative does not provide an opportunity to improve landscape-level health and diversity through vegetation management and stream restoration activities. Watershed restoration work such as road closures and decommissioning, culvert replacements, large wood placement, cutbank revetments, and riparian fencing would not occur. This alternative would provide few long-term benefits to the watershed through restoration activities; however short-term increases in soil erosion resulting from soil disturbance by restoration activities would not occur.

Existing headcuts would continue to move upstream, down-cut, and lower the water table (soil water level). Riparian vegetation would die off with a lowered water table. A shift to habitat that would support drier species would occur, potentially reducing effective ground cover and increasing soil erosion during high water events. Erosion would continue at the current value of at least 14 tons per year.

Streambed scouring would continue to occur at the outlets of undersized culverts. Bank erosion near the culverts would still be a long-term problem. Erosion (1-2 tons per year), associated sedimentation, and impacts to riparian vegetation in the areas where these culverts are located would continue.

Native surface roads would continue to be used, many of which run parallel to sensitive areas, thereby increasing sedimentation into the stream and affecting water quality. Current estimated tons of road related soil erosion is found in Table 10. Total soil erosion due to roads would remain greater than 35 tons per year. Soil would continue to be compacted and existing levels of detrimental soil condition would persist.

Table 10 – Tons of Soil Erosion Predicted by Road and Soil Type over a Quarter-Mile Length of Road Thirteen Feet Wide (WEPP).

Road Type	Soil Type	Soil Erosion (tons)
Insloped, bare ditch	Clay loam	5.22
Insloped, vegetated	Clay loam	0.32
Outsloped, rutted	Clay loam	6.49
Outsloped, unrutted	Clay loam	1.63
Insloped, bare ditch	Silt loam	4.23
Insloped, vegetated	Silt loam	0.33
Outsloped, rutted	Silt loam	5.27
Outsloped, unrutted	Silt loam	1.43
Insloped, bare ditch	Sandy loam	0.33
Insloped, vegetated	Sandy loam	0.11
Outsloped, rutted	Sandy loam	0.42
Outsloped, unrutted	Sandy loam	0.20
Insloped, bare ditch	Loam	5.05
Insloped, vegetated	Loam	0.40
Outsloped, rutted	Loam	6.35
Outsloped, unrutted	Loam	1.68

Soil erosion, mostly from gully erosion, would continue at its current rate. Estimated annual soil erosion for existing riparian conditions is in Table 11 (WEPP). Total soil erosion on lower Deep Creek (where the riparian pasture is proposed) would remain at 67 tons per year (WEPP).

Table 11 - Annual Estimated Soil Erosion for Existing Riparian Conditions by Soil Type (30 year Average).

Soil Type	Erosion (tons/acre)
Clay loam	4.22
Silt loam	4.96
Sandy loam	2.01
Loam	3.60

The no action alternative would provide few long-term benefits to the watershed through restoration activities. Short-term increases of erosion resulting from soil disturbance by restoration activities would not occur. The Deep Creek Watershed would continue to degrade.

Cumulative Effects: Past and present management within the Deep Creek Watershed include timber harvest, domestic livestock grazing, big game management, recreation, fire suppression, and road construction. These activities have in some way resulted in conditions that have contributed to the existing 140 tons of soil erosion per year, which does not approximate natural erosion rates.

Current and past stream restoration activities have helped stabilize soil erosion. These activities include culvert replacements, riparian planting, road closures, large wood placement, headcut restoration, spring development, and construction of livestock exclosure fences. Headcut restoration on Happy Camp Creek, Timothy Meadow, and Derr Creek has stopped the advancement of channel evolution, thus minimizing soil erosion. Spring developments such as at Double Corral Spring (Derr Allotment) have drawn cattle away from riparian areas and improved upon distribution thereby maintaining or improving effective ground cover and shade. Cattle exclosures on Little Summit Creek, Happy Camp Creek, Big Springs, Toggle Meadow, and Derr Meadow have also drawn cattle away from riparian areas. Recent or ongoing activities within the Deep Creek Watershed that have effected the current soil erosion rates include: SUDS 1992, Deep Salvage 1995, and domestic livestock grazing (4 allotments).

The Deep Vegetation Management EIS is an action in the foreseeable future, which could affect soil resources in the Deep Creek Watershed in a positive manner. This project proposes restoration projects that would promote healthier forest and riparian areas thru such activities as road closures, riparian planting, meadow enhancement, large wood placement, culvert replacements and dispersed site rehabilitation. These activities would help reduce the levels of erosion and increase soil productivity.

Livestock grazing would continue to contribute to erosion and denude riparian vegetation in preferred areas resulting in headcut development and advancement, excessive post-holing, trailing, and bank sloughing. Disturbances, such as soil compaction mainly from historic grazing and logging would remain at current levels. The Paulina Ranger District is currently in the process of completing the Westside Allotment analysis and revising AMPs. These AMPs will cover areas within the Deep Creek Watershed and small portions outside. The development of future AMPs within the Deep Creek watershed will recognize the dynamics between livestock seasonal usage (flexibility with traditional turn-on and turn-off dates), livestock distribution (variation of utilization between upland and riparian habitats), and livestock numbers (development of Animal Unit Months based on management objectives for riparian and upland range areas). The new AMPs are expected to improve riparian conditions and help stabilize soils.

Alternative 2 - Proposed Action

Direct and Indirect Effects: Modeling potential soil erosion rates, using the WEPP model, indicate a potential for accelerated but low erosion rates due to soil disturbance from proposed management activities. These increases are expected to be short-term (less than 2 years) and would continue to decrease as vegetative ground cover is reestablished following completion of restoration activities. Long-term benefits of decreased soil erosion would outweigh short-term soil erosion increases.

Headcut complexes would be stabilized and reduce soil erosion by approximately 14 tons/year. Headcut restoration activities would take place during periods of low flow typically found in late summer or early fall. It is expected that erosion levels on site would increase upon implementation of headcut repair and continue until work is completed and sufficient riparian vegetative cover is established. There would be short-term increases in erosion, but erosion rates would be much lower over the long term (>2yrs) as the headcuts stabilize and deeply rooted riparian species are reestablished. There is the potential to considerably reduce the amount of soil erosion resulting from the active headcuts.

Exposed cutbanks contribute an estimated 9.87 tons of soil erosion annually (WEPP). Cutbank revetment restoration would take place during periods of low flow typically found in late summer or early fall. It is expected that soil erosion levels on site would increase upon implementation of work and continue until work is completed and sufficient riparian vegetative cover is established. There would be short-term increases in erosion, but erosion rates would be much lower over the long term (>2yrs) as the cutbanks stabilize and deeply rooted riparian species are reestablished. Cutbank revetments would reduce estimated annual erosion rates by approximately10 tons in the Deep Creek Watershed (WEPP).

Alternative 2 would reconstruct two channel reaches totaling 12.14 acres on Deep and Happy Camp Creeks with the potential of reducing estimated annual erosion by 11.51 tons (WEPP). Channel reconstruction would stabilize stream channels, promote deeply rooted riparian vegetation, and reduce erosion rates. There would be a short-term increase in local soil erosion rates upon start of the project. Erosion rates on Deep Creek are not expected to reduce considerably in the long-term as the existing stream channel is stable.

Roads identified for closure, decommissioning, or reconstruction within this alternative currently produce an estimated 31.22 tons of erosion annually (WEPP). The proposed road treatments would reduce the amount of soil erosion over time. Road treatments would include ripping or scarification of the road surface, which would reduce compaction, promote the establishment of vegetative cover, and lower soil erosion rates. Decommissioning or closing roads would reduce erosion by approximately 31 tons by decompacting 57 acres. Creeks that are located adjacent to roads designated for treatment would benefit from the reduced soil erosion rates.

Spring developments would increase riparian vegetation adjacent to springs, which would protect the soil surface and consequently result in lower soil erosion. Three livestock exclosures would reduce utilization on riparian vegetation and lower trampling levels. In addition, 2.9 miles of large wood placement along riparian corridors would provide soil and riparian vegetation protection from over utilization by domestic livestock grazing in degraded riparian areas. Large wood if properly placed can help prevent and reduce bank erosion. In addition, large wood can help provide additional surface roughness on flood plains, which helps trap sediment and prevent erosion. There is the potential to reduce estimated annual erosion rates by 0.07 tons per acre from these activities (WEPP).

It is expected that erosion levels on culvert replacement sites would increase upon implementation of culvert replacement and continue until work is completed. There would be short-term increases in erosion, but erosion rates would be much lower over the long term (>2yrs) as stream flows are kept within regional specifications.

This alternative focuses on areas identified by resource personnel as in need of restoration or repairs because of degraded site conditions that are leading to a loss of riparian vegetation and increased rates of soil erosion. There is expected to be some short-term (<2yrs) increases in soil erosion from work occurring near/in the active stream courses. However, long-term benefits of decreased soil erosion have the potential to outweigh any short-term consequences resulting from a short-term increase in soil erosion. This alternative would reduce soil erosion by an estimated 77 tons per year over Alternative 1 (Table 12 on page 58).

Cumulative Effects: This alternative, when combined with other foreseeable activities (previously mentioned) such as those in the Deep Vegetation Management EIS, the Westside Allotment analysis, and AMP updates provide a foundation for reducing soil erosion rates. Alternative 2 would have positive cumulative effects to soil erosion in the short term (<2yrs) and long term (>2yrs). All ground disturbing activities in this alternative would add a relatively small increase in soil erosion, however they would minimize the amount of soil erosion (tons) occurring annually in the watershed. Considering past, present, and foreseeable actions, this alternative has the potential to reduce soil erosion over the short and long term.

Alternative 3

Direct and Indirect Effects: Modeling potential soil erosion rates, using the WEPP model indicates a potential for accelerated but low erosion rates due to soil disturbance from proposed management activities. These increases would be short-term (less than 2 years) and would continue to decrease as vegetative ground cover is reestablished following completion of restoration activities. Long-term benefits of decreased soil erosion would outweigh short-term soil erosion increases.

Headcut repair work would reduce soil erosion by approximately 12.68 tons (WEPP). Cutbank revetments would reduce estimated annual erosion rates by 6.67 tons within the watershed. The channel reconstruction site on Happy Camp Creek would reduce soil erosion by approximately 10.5 tons. Pool enhancement totaling 1.68 acres on Deep Creek would seek to enhance riparian vegetation and reduce soil erosion. Erosion rates at this site would be expected to be reduced, as the existing channel is stable. Road treatments would reduce soil erosion by approximately 35 tons and reduce compaction on approximately 74 acres. Exclosures, spring developments, and large wood placement activities would reduce soil erosion by 0.07 tons per acre per year. The riparian pasture on lower Deep Creek would reduce soil erosion by approximately 65 tons with increased vegetation cover resulting from riparian pasture management (WEPP). Culvert replacement activities are expected to increase soil erosion in the short-term, but erosion rates would be much lower over the long term (>2yrs) as the culverts are replaced and stream flows are unrestricted.

Cumulative Effects: When combined with all other previously mentioned past, present and foreseeable projects, this alternative would have positive cumulative effects to soils in the short term (less than 2 years) and long term (greater than 2 years). All ground disturbing restoration activities would initially add relatively small increases in soil erosion and associated sedimentation. Long-term, a reduction in ground disturbing activities along with the restoration activities would reduce the cumulative annual amount of soil erosion in the watershed.

Alternative 3 would reduce soil erosion by approximately 70 tons more than Alternative 2 (Table 12).

Table 12 – Soil Erosion Effects Comparison by Activity and Alternative.

Activity	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3
Headcut Repairs	≥ 14 tons/yr	Reduced by 14 tons/yr	Reduced by 13 tons/yr
Cutbank Revetments	≥ 10 tons/yr	Reduced by 10 tons/yr	Reduced by 7 tons/yr
Channel Reconstruction	≥ 12 tons/yr	Reduced by 12 tons/yr	Reduced by 10 tons/yr
Pool Enhancement	NA	NA	Short-term Increase (<2yr)
Culverts	≥ 1-2 tons/yr	Reduced by 1 ton/yr	Reduced by 1 ton/yr
Road Treatments	≥ 35 tons/yr	Reduced by 31 tons/yr *	Reduced by 35 tons/yr*
Exclosures:	0.07 tons/acre/yr	Reduced by 9 tons/yr *	Reduced by 16 tons/yr *
Riparian Pastures	67 tons/yr	67 tons/yr	Reduced by 65 tons/yr*
Large Wood Placement	0.07 tons/acre/yr	Rate of 0 tons/acre/yr *	Rate of 0 tons/acre/yr*
Spring Developments	0.07 tons/acre/yr	Rate of 0 tons/acre/yr *	Rate of 0 tons/acre/yr*
Soil Decompaction	0	57 acres	74 acres
TOTAL	**>140 tons/yr**	**Reduced by 77 tons/yr**	**Reduced by 147 tons/yr**

* Rates assume recovery of surrounding vegetation

Issue 4: Sensitive Plants

Sensitive Plants Measure #1 – Acres of Populations and Habitat Affected

Existing Condition

There are no known occurrences of federally listed endangered or threatened plants within the analysis area. The Ochoco National Forest has no habitat recognized as essential for listed or proposed plant species recovery under the Endangered Species Act.

Sensitive plants occur throughout the watershed, but most populations are concentrated within the Little Summit and Lower Deep Subwatersheds. Extensive surveys for sensitive plants have been conducted between 1991 and 2003 within the Deep Creek Watershed. There are 26 species on the Regional Forester's Sensitive Species List that are known to occur or have habitat on the Ochoco National Forest. Nine (9) sensitive species have suitable habitat within the watershed and four (4) plant species were found during the surveys that are on the Region 6 Forester's Sensitive Plant List (May 13, 1999). These species are listed in Table 13, page 59.

Modern-day use of the Deep Creek Watershed dates back more than a century, and includes domestic livestock grazing, timber harvest, fire suppression, and road building. Over time this has led to degraded riparian conditions (Deep Creek Water Quality Restoration Plan 2001, Deep Creek Watershed Analysis 1999), including a reduction of quality sensitive plant habitat and associated population isolation. Riparian vegetation and condition is directly tied to stream condition. The key to genetically diverse and demographically healthy plant populations is the maintenance of habitat distribution and connectivity (Marcot and Murphy 1992). This watershed contains 56% of the global population of Peck's mariposa lily. A viability assessment has been prepared for the Deep Restoration Project, and is located in the analysis file. The Peck's lily occurrences are well connected and fairly extensive along most tributaries within the watershed. The uppers stream reaches of West Thornton, Thornton, and Little Summit Creeks are well populated. Little Summit Prairie Subwatershed has the bulk of the Peck's mariposa lily (Peck's

Table 13 – Sensitive Plant Species with Suitable Habitat or Known Locations within the Deep Creek Watershed.

Species	Common Name	Habitat
*Botrychium ascendens**	Upswept moonwort	Wet meadows/streams, springs, seeps
*Botrychium crenulatum**	Crenulate moonwort	Wet meadows/streams, springs, seeps
*Botrychium minganense**	Mingan moonwort	Wet meadows/streams, springs, seeps
*Botrychium montanum**	Western goblin	Wet meadows/streams, springs, seeps
Botrychium paradoxum	Paradox moonwort	Wet meadows/streams, springs, seeps
Botrychium pinnatum	Northwestern moonwort	Wet meadows/streams, springs, seeps
Carex hystericina	Porcupine sedge	Stream banks
Carex interior	Inland sedge	Stream banks
Calochortus longebarbatus var. *peckii**	Peck's mariposa lily	Seasonally wet meadow and stream margins

* Sensitive species documented during surveys within the watershed.

lily) populations within the watershed, and 15 acres (>50%) of the moonwort populations. The watershed contains 12 known occurrences of moonwort, which includes nine locations of *Botrychium crenulatum,* two locations of *Botrychium montanum,* and one location of *Botrychium ascendens and Botrychium minganense.* The population of *B.crenulatum* within the analysis area is 1.5% of the Oregon total population. *B. montanum, B. minganense*, and *B. ascendens* are all less than 0.1% of the total Oregon population. Moonworts are particularly difficult to locate and not all high probability habitat has been surveyed; the extent of moonwort habitat is unknown. More than 10 acres of moonwort populations occur in this subwatershed.

The populations of Peck's mariposa lily within the upper stream reaches are critical for genetic viability, for downstream colonization of new populations, and maintaining a stable population (Croft, pers. comm.). This plant relies completely on asexual reproduction, producing one bulblet per plant, per year, and may remain dormant for many years, with no reproduction (Fredricks 1989). The Jackson Creek Subwatershed has 34 critical occurrences over 136 acres of Peck's mariposa lily and the populations are small and isolated.

Environmental Effects

Introduction

Sensitive plant population data used in the analysis was obtained from the Oregon Natural Heritage Program database. Guidance for managing populations comes from species viability assessments (see the Botany Biological Evaluation), the Draft Species Management Guide for Peck's mariposa lily, and literature.

The desired future condition (DFC) for sensitive species analyzed in this report is to ultimately remove them from the U.S. Fish and Wildlife Service's Species of Concern list, and from the Regional Forester's Sensitive Species list. Ensuring that the species are well distributed with viable, increasing populations within the Ochoco National Forest can contribute to this desired condition. The LRMP does not specifically identify a desired future condition for sensitive plant species. It does address riparian areas, which provide important habitat for sensitive species within the Deep Watershed. The LRMP states that most of the riparian areas will be in excellent condition within 50 years, characterized by vigorous stands of forbs, grasses and grass-like species on stable stream banks.

The acres of populations and habitat affected are described below. In addition to the amount of acres of direct effects, the location of populations affected was also taken into consideration for Peck's mariposa lily, due to reproductive requirements. Critical populations include those in upper reaches of each stream and select populations.

Alternative 1 - No Action

Direct and Indirect Effects: The no action alternative would result in continued degradation of stream conditions in the short-term, and the loss of sensitive plant populations and habitat over time. Existing headcuts on streams would continue to move upstream, effectively lowering the water table. Adjacent riparian vegetation and sensitive plant habitat would disappear, changing the species composition. Culverts would remain undersized with an increased water velocity that would scour the streambed below (Deep Creek Watershed Analysis 1999).

Native surface roads would continue to be used with many running parallel to sensitive species populations and habitat, increasing sedimentation into adjacent streams. Excess soil deposition and siltation may be especially problematic for moonworts; these small plants can be smothered (Potash 1998). It is speculated that Peck's mariposa lily is spread by bulblets moving downstream during high water flow. Roads that cross drainages would continue to affect bulblet dispersal.

Desired future conditions for riparian areas (including sensitive plants and habitat), as defined by the LRMP and the Deep Creek Watershed Analysis, would not be met in either the short-term (3-5 years) or the long-term (50 years), under this alternative.

Cumulative Effects: Recent activities within the watershed that have incrementally added to poor plant habitat conditions include: SUDS 1992, Deep Salvage 1995, and Summit 1996. Treatments under these actions include timber harvest, prescribed natural fuels burning, and precommercial thinning (prescribed burning in Summit is still occurring). Beneficial effects from these actions include precommercial thinning within riparian areas and Peck's lily populations, and prescribed burning that is allowed to back down into riparian areas. Both of these activities reduce conifer encroachment.

Long-term past activities that continue to affect stream condition include sheep grazing until the 1940's, cattle grazing, fire suppression, and road building. Cattle and native ungulates have a two-fold effect on Peck's mariposa lily. Intensive lengthy and repetitive grazing can change the microclimate of streams and meadows in the long-term, and the plants themselves can be affected by trampling and by consumption of the basal leaf. Grazing of the basal leaf each year can reduce the life of an individual by limiting the amount of photosynthate available for bulb renewal (Fiedler 1987). However, Peck's mariposa lily does appear to tolerate moderate grazing pressure, and there is some indication that grazing helps keep habitat in a mid-seral successional stage that benefits this plant.

Grazing also affects moonwort, inland, and porcupine sedge habitat through changes in microclimate and trampling; vegetative loss appears to be incidental. Porcupine sedge and *Botrychium* species often occur in bog/wetland habitats that are too wet for cattle to graze for extended periods.

Cumulative effects of fire suppression and loss of water table has resulted in conifer development within riparian areas. This is especially true in areas where cold air pools encourage lodgepole pine establishment along Jackson, Derr and Happy Camp Creeks. Encroachment of conifers

appears to limit Peck's lily habitat on many of the streams in the planning area. The plant does not appear to do well under heavy shade. Competition from rhizomatous grasses, particularly introduced grasses such as intermediate wheat grass (*Agropyron intermedium*) and smooth brome (*Bromus inermis*), is increased with suppression of wildfire. Many *Calochortus* species are poor competitors, and this may be a cause of reduced vigor in some populations.

Roads, including temporary roads, alter stream drainage patterns by confining the stream and reducing the area within the floodplain so floodplain interaction is disturbed. This in turn affects riparian habitat and its function. Roads that cross drainages can affect bulblet dispersal.

The Deep Vegetation Management EIS is an action in the foreseeable future, which could affect riparian sensitive species. Short-term effects to sensitive species, especially Peck's mariposa lily, through timber harvest, burning and in-stream activities would occur. However in the long-term, riparian vegetation in general would be somewhat improved due to conifer removal (limited) in riparian areas, road closures, culvert replacement and shrub plantings. Another future action is the planned Westside grazing NEPA, which includes the Deep Creek Watershed.

Desired future conditions for sensitive plants and habitat, as defined by the Forest Plan and the Deep Creek Watershed Analysis, would not be met in either the short-term (3-5 years) or the long-term (50 years), under the Alternative 1.

Alternative 2 - Proposed Action

Direct and Indirect Effects: Alternative 2 would result in a biological evaluation determination of "Will impact individuals or habitat with a consequence that the action may contribute to a trend towards Federal listing or cause a loss of viability to the population or species" for Peck's mariposa lily. This triggers a significant action as defined in NEPA (USDA Forest Service 1995). This determination is based on potential effects resulting in a significantly increased risk of loss of viability to a significant population.

Direct effects to Peck's lily habitat are estimated at 165 acres, from headcut repair, cutbank revetment, and channel reconstruction. Short-term (2 to 3 years) indirect impacts are possible to habitat and populations that are adjacent to all proposed activities, including road decommissioning and culvert replacement. A short term, localized increase in sedimentation would be expected. This may affect Peck's mariposa lily by changing microsite conditions.

There are 117 headcuts, within 44 complex areas, that would be repaired. Cutbank revetments (32) are estimated at 1/10 acre each. Channel reconstruction would be the most intrusive activity, where new channels are dug, and excavated material used to fill in the old channel. There is an estimated 12 acres of direct effects to a lily population on Deep Creek on the lower end of the watershed.

Four (4) percent of the total Peck's lily population acreage within the watershed would be directly affected in this alternative. Design elements would reduce the potential impacts. The magnitude of this loss would be an immediate downward change of the population, which would not likely be recoverable in the long-term (50 years). The length of time it would take for these new bulblets to move downstream and colonize a new site is unknown, but would be expected to be extremely slow.

Within upper stream reaches, there are approximately 21 acres of Peck's lily habitat that would be directly affected. In the Jackson Subwatershed, three critical populations (upper reach) would have more than one-third of the population destroyed. In the Little Summit Subwatershed, two critical populations would be nearly 100% destroyed by the proposed headcut repairs.

Approximately 0.5 acre of a 2-acre Mingan moonwort population would be directly affected by cutbank revetment and headcut repair on Jackson Creek. Mingan moonwort is endemic and abundant across the continent (Wagner 1993). Although any loss of moonworts is detrimental to the local population, this effect would not result in a loss of overall species viability (refer to viability analysis in Official Record). There is a possibility of short-term indirect effects to 12 moonwort populations adjacent to proposed activities.

There are no populations of inland or porcupine sedge within the analysis area. Habitat would be directly affected by excavation through headcut repair, cutbank revetments, and channel reconstruction. In the long-term, habitat would be benefited through improved riparian condition.

Direct effects aside, all of the proposed activities would have long-term beneficial impacts to riparian areas by reducing sedimentation, lowering peak flow damage potential, reducing lateral scour, and promoting vegetation recovery. However, this alternative would not move toward the desired future condition for sensitive plants. The extent of the direct effects to Peck's mariposa lily would jeopardize the viability of the Deep Creek metapopulation, which would not work towards removing the species from the Regional Forester's list. The same is true for Mingan moonwort; there would be direct effects to individuals.

Cumulative Effects: Cumulative effects are described under Alternative 1. The activities proposed in Alternative 2 would directly affect Peck's mariposa lily populations, which results in a significantly increased risk of loss of viability to a significant population (the Deep Creek metapopulation). The long-term effects to Peck's lily habitat would be very beneficial, because this alternative does the most to reduce sediment, lateral and downward stream scour, and peak flows.

Benefits to some sensitive plant populations, 23 acres, (both moonworts and Peck's lily) would occur from the exclusion of grazing by the Toggle and Thornton exclosures. Porcupine sedge and inland sedge habitat would also benefit from the Toggle Creek and Thornton Creek exclosures.

The proposed 29 miles of road closure and decommissioning in Alternative 2 would benefit all sensitive species populations, in particular Peck's lily populations and habitat by eliminating the compaction, preventing further vehicle travel and reducing sediment run-off in the long-term.

Alternative 3

Direct and Indirect Effects: Alternative 3 would result in a biological evaluation determination of "May impact individuals or habitat but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species". This alternative would move towards the desired future condition for improved riparian areas, although at a slower rate than Alternative 2.

This alternative would not move toward the desired future condition for Peck's mariposa lily populations, due to direct effects to individuals. The spatial arrangement, timing and reduced effects to critical upper watershed populations are not expected to jeopardize the viability of the

Deep Creek metapopulation. There would also be short-term indirect effects to moonwort populations.

All cutbank revetment projects proposed in Alternative 2 within sensitive plant populations would not occur. Headcut repairs within Peck's lily populations would occur only where necessary to stop further upstream habitat degradation and loss within a population. Four (4) headcut complexes, located in the downstream end or middle of a population, would have direct site specific adverse effects to critical Peck's lily populations (8.8 acres). Headcut repair would prevent the headcut from continuing to move upstream, enhancing or maintaining the current water table and adjacent riparian species. Table 14 shows the acres of long-term protection of Peck's lily populations that would be protected by headcut repair.

Table 14 – Proposed Acres of Peck's Lily Potentially Protected by Headcut Repairs.

Population Location by Creek Name	Acres of Peck's lily Potentially Protected	Upper Reach Population	Selected Population
Derr	8 acres	X	X
Thornton	53 acres	X	X
West Fork Thornton	119 acres	X	
Little Summit	33 acres	X	X

Creation of pool habitat would replace channel reconstruction, proposed in Alternative 2, to benefit water quality and fisheries. Pool habitat creation would be less detrimental to sensitive plants than channel reconstruction, reducing the adverse effects to the lower Deep Creek lily population by approximately 83 percent. A large riparian pasture, 342 acres, would be set up to encompass most of the lower Deep Creek Peck's lily population. A riparian exclosure would also be constructed on Jackson Creek, encompassing several plant populations and protecting 1.75 miles of riparian habitat, substantially reducing grazing pressure on plants and habitat.

With fewer direct effects to critical populations, Alternative 3 would maintain a better overall population distribution pattern than Alternative 2. Two (2) percent of the total Peck's lily population acreage within the watershed would be directly affected in this alternative. Alternative 3 attempts to balance an acceptable loss of individuals through accomplishing as many projects as possible, making the watershed safer for Peck's lily in the long-term.

An additional 11.6 road miles (30 miles total) would be decommissioned to improve and protect Peck's mariposa lily populations. Decommissioning 11.6 miles of road would reduce sediment transport into Peck's lily populations by approximately 1 ton per year (Deep Restoration Hydrology report).

There would be no direct effects to moonworts under Alternative 3. The proposed cutbank revetment project on Jackson Creek that would have impacted Mingan moonwort has been dropped. Effects to inland sedge and porcupine sedge habitat are slightly reduced in this alternative (Table 15 on page 64). This is the result of protecting actual sensitive plant populations (Peck's lily and Mingan moonwort) by dropping projects within sedge habitat. Long-term benefits to inland sedge and porcupine sedge habitat would be reduced.

This alternative would not move toward the desired future condition as outlined in the LRMP for Peck's mariposa lily populations, due to direct effects to individuals. The spatial arrangement, timing and reduced effects to critical upper watershed populations are not expected to jeopardize the viability of the Deep Creek metapopulation. There would also be short-term indirect effects

to moonwort populations. This alternative would move towards the desired future condition for improved riparian areas, although at a slower rate than Alternative 2.

Cumulative Effects: Cumulative effects are described under the No Action Alternative. The negative cumulative effects to Peck's lily and moonworts would be less under this alternative than for either No Action or Alternative 2 in the long-term. The Peck's lily metapopulation viability would not be at risk, and habitat would be improved and populations stabilized.

Table 15 – Acres of Existing Sensitive Plant Populations and the Habitat Affected by Alternatives.

Sensitive Species	Existing Condition	Alternative 1	Alternative 2 (Proposed Action)	Alternative 3
Total Peck's lily populations (acres)	1,317	0	51	27
Selected Peck's lily populations (acres)	789	0	13	6
Peck's lily populations in upper stream reaches (acres)	563	0	21	9
Peck's lily habitat (acres)	7,344	0	165	137
Moonwort populations (acres)	28	0	0.5	0
Moonwort habitat (acres)	Unknown	0	Unknown	Unknown
Porcupine sedge populations (acres)	0	0	0	0
Porcupine sedge habitat (acres)	2,231	0	47	39
Inland sedge populations (acres)	0	0	0	0
Inland sedge habitat (acres)	2,231	0	47	39

Additional Resource Effects

Wildlife Species and Habitat

Existing Condition - Threatened, Endangered, Proposed, Sensitive and Management Indicator Species (MIS).

The following species (Table 16), identified under the Endangered Species Act of 1973 and the Regional Foresters Sensitive Species List, are known, suspected, or could possibly occur within the project area. Some of the species that are likely to occur within the project area do not have adequate suitable habitat. Other species that have habitat within the project area would not be affected because the proposed activities would not occur in those areas. Suitable habitat is not available for other species although suitable habitat occurs within the Paulina Ranger District.

The Ochoco National Forest Land and Resource Plan (LRMP) identifies a list of species as being Management Indicator Species (MIS), as directed by the National Forest Management Act of 1979. That list consists of the pileated woodpecker and all other primary cavity excavators present on the Ochoco National Forest (LRMP, 4-243). The pileated woodpecker was selected for its preference of late and old structure forest (old growth). The remaining primary cavity excavator species were selected based upon their need for suitable snag habitats across a variety of vegetation and habitat types.

Table 16 – Species Known, Suspected, or Could Possibly Occur within the Deep Creek Watershed.

Species	Listing	Presence
Northern Bald Eagle (*Haliaeetus leucocephalus*)	Threatened	Suspected (documented - Paulina Ranger District)
Canada Lynx (*Lynx Canadensis*)	Threatened	Unconfirmed (no suitable habitat - Ochoco National Forest)
California Wolverine (*Gulo gulo*)	Sensitive	Suspected (documented - Ochoco National Forest, unconfirmed sightings - Paulina Ranger District)
Pygmy Rabbit (*Sylvilagus idahoensis*)	Sensitive	Not Present (suspected - Ochoco National Forest)
Columbia Spotted Frog (*Rana Luteiventris*)	Sensitive	Confirmed (documented - project area)
Peregrine Falcon (*Falco peregrinus anatum*)	Sensitive	Unconfirmed (no suitable habitat - project area)
Sage Grouse (*Centrocercus utophasianus*)	Sensitive	Suspected (confirmed - Paulina Ranger District)
Bufflehead (*Bucephala albeola*)	Sensitive	Not Present (no suitable habitat - Watershed)
Upland Sandpiper (*Bartramia longicauda*)	Sensitive	Unconfirmed (suspected - Ochoco National Forest)
Tri-Colored Blackbird (*Agelaius tricolor*)	Sensitive	Not Present (no suitable habitat - Watershed)

Summary determination for effects/impacts on the species assessed in the Wildlife Biological Evaluation for the Deep Creek Watershed are in Table 17.

Table 17 - Summary Of Effects Determinations For Threatened, Endangered And Sensitive Wildlife Species For the Deep Watershed Restoration Project.

Species	Listing	Presence/Absence	Determination By Alternative*		
			Alternative 1	Alternative 2	Alternative 3
Northern Bald Eagle	Threatened	Suspected	NE	NE	NE
Canada Lynx	Threatened	Unconfirmed	NE	NE	NE
California Wolverine	Sensitive	Suspected	NI	NI	NI
Pygmy Rabbit	Sensitive	Absent	NI	NI	NI
Columbia Spotted Frog	Sensitive	Confirmed	NI	MIIH	MIIH
Peregrine Falcon	Sensitive	Unconfirmed	NI	NI	NI
Sage Grouse	Sensitive	Suspected	NI	NI	NI
Bufflehead	Sensitive	Absent	NI	NI	NI
Upland Sandpiper	Sensitive	Unconfirmed	NI	NI	NI
Tri-Colored Blackbird	Sensitive	Absent	NI	NI	NI

*NE = No Effect; NI = No Impact; MIIH = May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or the Species.

The terrestrial species identified in Tables 16 and 17, with the exception of the Columbia spotted frog, reached determinations of No Effect (NE) or No Impact (NI). In many cases, this was due to lack of habitat. In other cases, habitat and/or individuals are present, and the proposed

activities would not effect or impact those species. Species, other than the Columbia spotted frog (MIIH) and MIS species, will not be further discussed within the EA.

Environmental Effects

Management Indicator Species (MIS)

The activities proposed in each of the action alternatives, along with the no action alternative, would not result in effects to the pileated woodpecker or other primary cavity excavators. There would be no changes to the overall vegetative habitat condition for any of the identified species. Likewise, snag and down log habitats would not be affected by the activities proposed. There is the likelihood that some riparian habitat conditions may improve with the implementation of many of the activities identified in the action alternatives. Improved riparian habitat conditions could result in habitat conditions that are more favorable to the Williamson's and red-naped sapsuckers. This could result in an incremental increase in available habitat. However, habitat features that would be required to see any change in these species' populations and distribution would require larger hardwood trees such as cottonwood and aspen. While such change may occur, the length of time required to get to such a condition may be well into the long term (30 years or more). Such effects are long term. Due to the relatively small scale that these changes would occur, these effects and potential changes to populations and distribution are not likely measurable.

Columbia Spotted Frog

Columbia spotted frogs prefer springs, small ponds or lakes, or sluggish stream habitats. Cold-water conditions appear important (Leonard et al. 1996). Sedges, rushes and other similar aquatic habitat components are favored. Suitable and occupied habitat was documented in Deep Creek in 1993. Other stream systems in the project area may also contain suitable habitats and/or populations. Due to degraded stream conditions, populations within the project area are likely isolated, increasing the risk and concern for localized losses of populations and reduced resiliency.

Alternative 1 – No Action

Direct and Indirect Effects: The current condition of habitat would be maintained. Populations would remain disconnected and isolated.

Cumulative Effects: Alternative 1 would not result in additional cumulative effects upon existing Columbia spotted frog populations within the project area. Livestock grazing, road building, harvest activity in the uplands and other activities that have affected water quality have affected the quality and condition of suitable habitat in the project area, as well as the fragmented condition of existing populations. This alternative would not contribute to those effects.

Alternative 2 - Proposed Action

Direct and Indirect Effects: This alternative would have the greatest potential for short-term adverse direct and indirect effects to the Columbia spotted frog, due to the level of channel reconstruction that is proposed. These effects would generally be indirect, as the areas identified for channel reconstruction would occur in areas not considered functioning spotted frog habitat. Most of these areas maintain intermittent flows during the summer, or are completely dry. Sedge and other riparian vegetation cover is generally absent, a result of degraded streambank

conditions and affects of other management activities such as livestock grazing. However, with the level of disturbance associated with channel restoration work, sediment inputs could potentially result in habitat affects downstream from these channel restoration activities. The level of effect is not known, as it would be dependent upon the level of disturbance, amount of sediment input that occurs in the stream, and where that sediment would ultimately be deposited.

Likewise, culvert removals and/or reconstructions, head cut repairs and cut bank revetments could also contribute sediment that could result in short-term adverse effects. In the mid to long-term, however, the restoration activities would likely result in overall habitat improvements. Reduction in sediment contributions to the stream systems with the road decommissions, along with the improvement of water quality through the stream restoration activities would result in beneficial effects to the species. Additional suitable habitat would eventually be available, allowing for population expansion into "new" habitats, and potentially reduce the level of fragmentation that currently exists. Overall, mid and long-term beneficial effects could occur.

Cumulative Effects: This alternative would contribute to adverse cumulative effects to suitable habitat with the contribution of sediment into the stream systems as a result of some of the restoration activities proposed. These would be short-term cumulative effects. In the mid to long-term, the activities would work to reverse the cumulative adverse effects of previous actions and activities that have degraded habitat conditions for this species. However, exclosures, spring developments, and large wood placement would promote better habitat for the frogs with vegetative recovery.

Alternative 3

Direct and Indirect Effects: This alternative would result in short-term direct and indirect effects to Columbia spotted frog habitat in the project area. However, the level of effect would be less than Alternative 2. Alternative 3 proposes less channel reconstruction activities, which would result in a lower level of potential sediment input and short-term negative water quality effects. Existing suitable habitat would not be affected by this alternative, as areas proposed for restoration actions in this alternative currently do not function as suitable habitat. Adverse effects would be short term, until such time as the restoration actions stabilize. Over the mid to long-term, overall effects would be beneficial, as water quality and habitat conditions would improve. Due to the reduced level of channel restoration in this alternative, when compared to Alternative 2, the overall level of beneficial effects would likely be less than Alternative 2. However, Alternative 3 proposes greater numbers of roads to be decommissioned, further reducing road related water quality effects to the stream systems. These positive effects would be greater in Alternative 3 than Alternative 2.

Cumulative Effects: This alternative would contribute to adverse cumulative effects to suitable habitat with the contribution of sediment into the stream systems as a result of some of the restoration activities proposed. These would be short-term cumulative effects. In the mid to long-term, the activities would work to reverse the cumulative adverse effects of previous actions and activities that have degraded habitat conditions for this species. The level of effects, both adverse and beneficial, would likely be less than Alternative 2, as fewer channel restoration activities would occur.

Determination: A No Impact (NI) determination is reached for Alternative 1 as proposed in the Deep Creek Watershed Restoration project. This alternative would not result in direct, indirect or cumulative effects to habitat or populations of Columbia spotted frogs. A May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or the Species (MIIH) determination is reached for Alternatives 2 and 3 as proposed.

Transportation System

Existing Condition

Roads can be categorized by the type of travel for which they are maintained and are separated into three categories: Level 1, Level 2, and Levels 3, 4, and 5. Level 1 roads are closed primarily for resource protection and safety. Level 2 roads are high clearance roads (pickups, all purpose vehicles, etc). Level 3, 4, and 5 roads are suitable for use by low clearance vehicles. Table 18 displays the number of miles of each road category within the planning area. Table 19 displays the open road density by subwatershed. There are approximately 285 miles of Forest Service roads within the Deep Creek Watershed. There are approximately 65.4 miles of road within riparian habitat conservation areas (RHCAs). Within the watershed there are 12 Class 1 stream crossings, 44 Class 2 stream crossings, and 147 Class 3 and 4 stream crossings (See Appendix C, page 117 for stream class definitions).

A Roads Analysis was recently completed for the Deep Creek Watershed (USFS 2002). The Deep Creek Watershed has approximately 45 miles of arterial and collector roads. Approximately 190 of the 285 miles of system roads are open, for an open road density of approximately 2.2 miles per square mile. The Forest Plan within MA-F22 provides open road density direction of 3 miles per square mile.

Table 18 – Miles of Road within the Deep Creek Watershed by Classification.

Classification	Miles
Level 1	95
Level 2	163
Level 3, 4, 5	27
TOTAL	285

Table 19 – Open Road Density within the Deep Creek Watershed by Subwatershed.

Subwatershed	Open Road Density (miles/square mile)
Jackson Creek	2.46
Little Summit Creek	2.47
Lower Deep Creek	1.42

Environmental Effects

Introduction

Road development provides some of the greatest impacts to the watershed through increased sediment flow to streams, adversely affecting aquatic habitats (Deep WA 1999). Roads intercept and collect surface and subsurface water, providing a concentrated flow into culverts, increasing water velocity and erosion. The first logging roads into the watershed were constructed during the 1940s through the 1960s. Many of these roads lacked adequate drainage, resulting in rills and gullies. Deposition of sediment into streams from roads during this period was high. Many of the roads have not been constructed with adequate drainage structures. Most roads are unsurfaced, lack armoring on fill slopes, and do not have water-bars or drain dips to protect against erosion and road failure. During storm events, runoff is often concentrated into rills that transport sediment into streams, particularly at stream crossings and where roads parallel streams.

Alternative 1 - No Action

Direct and Indirect Effects: The transportation system would remain as it exists. Inadequate drainage and road construction would result in continued erosion. Roads within 200 feet of streams would continue to limit stream shade potential and reductions in sediment yield to the stream.

Cumulative Effects: Approximately 16.2 miles of road closures and 15.2 miles of road decommissioning are proposed under Alternative C (Modified) of the Deep Vegetative Management Project FSEIS. These treatments would help eliminate some of the drainage problems within this watershed and help move the watershed towards desired watershed conditions. Table 20 displays the number of miles of each road category within the planning area.

Table 20 - Miles of Road within the Deep Creek Watershed by Classification, with the Implementation of Alternative 1 and Alternative C of the Deep FSEIS.

Classification	Miles
Level 1	99
Level 2	145
Level 3, 4, 5	27
TOTAL	271

Of the 285 miles of existing system roads, 14 miles would be decommissioned following implementation of Alternative C of Deep Vegetative Management Project FSEIS, leaving a total of 271 miles of system roads located in the planning area. Of the 271 miles of system roads within the planning area, approximately 172 would be open, for an open road density of 1.99 miles per square mile. Table 21 displays the open road densities within the Deep Restoration Planning Area by subwatershed, with the selection of Alternative C of the DeepVegetation Management Project FSEIS.

Table 21 – Open Road Density within the Deep Creek Watershed by Subwatershed, with the Implementation of Alternative 1 and Alternative C of the Deep FSEIS.

Subwatershed	Open Road Density (miles/square mile)
Jackson Creek	2.23
Little Summit Creek	2.18
Lower Deep Creek	1.28

To date, approximately 47 miles of roads within the Deep Creek Watershed have been decommissioned. No long-term need was identified for these roads and there are no plans to re-use these roads in the future.

Alternative 2 - Proposed Action

Direct and Indirect Effects: Table 24, page 70 displays Forest roads and number of miles of each road proposed for closure and decommissioning under Alternative 2. Approximately 16.96 miles would be inactivated and approximately 16.98 miles would be decommissioned. An inactivated road is defined as a road that is managed in a stored or closed category for long-term intermittent use. A decommissioned road is defined as a road that is no longer needed and not planned to be used again, it has been closed and generally, has been returned to production. Of the 285 miles of existing system roads within the planning area, approximately 156 miles would remain open following proposed closure or decommissioning. Overall open-road density would

be approximately 1.86 miles per square mile following proposed road activities, compared to 2.2 miles per square mile in Alternative 1.

Cumulative Effects: This alternative includes reasonable foreseeable actions proposed under the Deep Vegetative Management Project FSEIS. The FSEIS project would close 16.2 miles of road and decommission 15.2 miles.

The selection of Alternative C (Modified) of the Deep Vegetation Management Project FSEIS would help eliminate some of the drainage problems within this watershed. This would help move the watershed towards desired watershed conditions. Table 22 displays the number of miles within each subwatershed with the implementation of Alternative 2 from this project and Alternative C (Modified) from the Deep Vegetation Management Project FSEIS.

Table 22 – Open Road Density within the Deep Creek Watershed by Subwatershed, with the Implementation of Alternative 2 and Alternative C of the Deep FSEIS.

Subwatershed	Open Road Density (miles/square mile)
Jackson Creek	2.12
Little Summit Creek	1.75
Lower Deep Creek	1.24

Alternative 3

Direct and Indirect Effects: Approximately 17.2 miles would be inactivated and approximately 27 miles would be decommissioned. Of the 285 miles of system roads presently within the planning area, approximately 150 miles would remain open following proposed closure or decommissioning. Overall open-road density would be approximately 1.79 miles per square mile following proposed road activities. Road density by subwatershed would be as listed in Table 23.

Table 23 – Open Road Density within the Deep Creek Watershed by Subwatershed with the Implementation of Alternative 3.

Subwatershed	Open Road Density (miles/square mile)
Upper Deep Creek	2.10
Little Summit Creek	1.58
Lower Deep Creek	1.24

Cumulative Effects: Considering roads that will be closed and under Alternative 3, as well as those proposed under Alternative C (Modified) of the Deep Vegetative Management Project FSEIS, substantial progress would be made toward reducing road related sedimentation. Table 24 gives a summary of road treatments by alternative.

Table 24 – Summary of Road Treatments by Alternative in the Deep Creek Watershed.

Road Activity	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3
Closed: Miles	0	17.12	17.36
Decommission: Miles	0	18.92	30.08
Reconstruction: Miles	0	2.50	2.50

Heritage Resources

Existing Condition

A variety of man-caused and natural disturbances to archaeological sites have occurred within the project area. Most surface prehistoric sites have been disturbed. Logging and road building tend to displace great amounts of soil, substantially disturbing prehistoric sites. To a lesser degree, livestock grazing, dispersed recreation, and erosion have also disturbed prehistoric and historic sites. Terraces along streams, prone to disturbance from flooding and wildlife use, are normally high probability areas for cultural materials. Probably the most damaging agent to archaeological sites is from looting, ranging from the occasional surface find to the purposeful digging and screening for artifacts. Some prehistoric sites still reflect small craters from past illegal excavations. Depending on location, impacts to sites within this watershed range from zero surface and/or subsurface disturbance to 100% destruction.

The areas analyzed in the field for this Environmental Assessment (EA) were site specific to the proposed areas of project activities: segments of streams, existing culverts, springs, and existing roads. Heritage inventories have been conducted within this watershed from 1977 to the present day. These surveys have ranged from small aspen stand fencing projects to large watershed analysis. In 1998 and 1999 a total of 1,614 acres were surveyed for the Deep Vegetation Management FSEIS; no new sites were recorded. Surveys prior to 1998 totaled 32,766 acres with 250 sites recorded. In addition to these past inventories, all proposed project locations for this current project were field surveyed for a total of 147 acres. Eleven new sites were located and 14 known archaeological sites were visited and updated for this analysis.

Management direction for cultural resources is found in the Ochoco National Forest Resource Management Plan, in the Forest Service manual, section 2360, in federal regulations 36 CFR64 and 36 CFR800, the Region Six Programmatic Agreement with Oregon OSHPO and ACHP (Advisory Council on Historic Preservation) and in various federal laws including the National Historic Preservation Act of 1966 (as amended), the National Environmental Policy Act, and the National Forest Management Act. In general, the existing management direction asks the Forest to consider the effects on cultural resources when considering projects that fall within the Forest's jurisdiction. Further direction indicates that the Forest will determine what cultural resources are present on the Forest, evaluate each resource for eligibility to the National Register of Historic Places, and protect or mitigate effects to those resources that are eligible.

Prehistoric Use

The environmental attributes of this watershed have contributed to the relatively high density of prehistoric use. Within the Deep Creek Watershed, the archaeological record indicates the presence of 92 lithic (stone tool manufacturing) sites with 20 of those 92 sites having been evaluated as eligible for inclusion within the National Register of Historic Places (NRHP). Lab analysis on an obsidian tool found at one of these sites has been dated as approximately 2500-3200 years since the obsidian was quarried from its source.

Members of the Confederated Tribes of the Warm Springs Reservation continue to use the Ochoco uplands and the Tribes hold off-Reservation treaty rights for fishing, hunting, gathering roots and berries, and pasturing livestock under the Treaty with the Tribes of Middle Oregon of 1855. Members of the Confederated Tribes of the Warm Springs, Burns Paiute, Umatilla, and

Klamath Tribes use a wide variety of plant species that can be found within the Planning Area. The six primary cultural plant species gathered are displayed in Table 25.

Table 25 – The Primary Cultural Plants and their Habitats within the Deep Creek Watershed.

Scientific Name	Common Name	Habitat
Lewisia rediviva	bitterroot	scablands
Lomatium cous	biscuitroot	scablands
Lomatium canbyi	desert parsley	scablands
Camassia quamash	camas	moist meadows and seeps
Perideridia gairdneri	yampah	moist/dry meadows and shrub lands
Bryoria fremontii	black lichen	pine forests

Historic Use

The earliest known Euro-American presence in the watershed can be traced to 1846. Trappers, hunters, and miners used this area in the mid-1800s with ranchers and farmers homesteading before the turn of the 20th Century. Livestock pasturing, and the range wars that accompanied it, continued into the early 1900s, culminating in the development of the Ochoco National Forest in 1911. Within the planning area, the archaeological record indicates the presence of 113 historic sites with 22 of those sites having been evaluated as eligible for inclusion within the National Register of Historic Places (NRHP). Historic sites range in condition from very deteriorated to relatively intact. A total of 45 sites within the watershed consist of rock features, mainly cairns. No rock features have been evaluated as being eligible for inclusion within the National Register of Historic Places.

Environmental Effects

Alternative 1 - No Action

Direct and Indirect Effects: Current management would continue. Areas with springs are a high probability for archaeological sites and possible subsurface materials. These areas would remain undisturbed from proposed management activities. Existing undersized culverts would remain in place. The scouring of stream banks adjacent to undersized culverts during peak flows or events (80-100 year flood) could displace and wash buried cultural materials down stream. Bank erosion along streams would continue, possibly displacing subsurface materials. Headcuts would continue eroding upstream, placing those cultural materials at risk was well. All roads would remain open and vehicle access to traditional grounds, known only to Tribal member families, would not be blocked. Oregon Tribes with fishing rights would not have the benefit of restored rivers for redband trout and other native fishes. Populations of cultural plants along streams would remain undisturbed.

Cumulative Effects: A variety of impacts, both man-caused and natural, have disturbed archaeological sites within this project area. Likely future actions within this planning area would include the proposed activities for the Deep Vegetation Management Project FSEIS. All heritage sites would be avoided during implementation of the Deep Vegetation Management Project FSEIS projects.

Alternative 2 – Proposed Action, and Alternative 3

Direct and Indirect Effects: With implementation of these alternatives, there would be a need for heritage resource management to avoid and/or protect the qualities that make these sites

eligible to the NRHP. Table 26 displays the number and types of known archaeological sites within the project area and the number of those sites that would be potentially affected with implementation of either Alternative 2 or 3.

Table 26 –Number of Archaeological Sites within Proposed Projects Areas – Alternatives 2 and 3

	Total Number of Sites Within Project Area	NRHP Eligible Sites Within Project Areas for Alternative 2	NRHP Eligible Sites Within Project Areas for Alternative 3	Sites Needing Protection for Alternative 2 and Alternative 3
Historic	113	7	7	7
Prehistoric	92	11	11	11
Other	45	0	0	0
Cultural Plant Populations	9	0	0	0

Cumulative Effects: Heritage sites would be avoided through project layout and design or protected during project implementation to achieve a finding of No Effect with the Oregon State Historic Preservation Officer (OSHPO). However, natural and human disturbance agents would affect Heritage resources within this planning area regardless of how well protected cultural materials would be during proposed activities for this EA. Livestock grazing is expected to continue within this planning area and additional streamside areas would be impacted along with surface and subsurface cultural materials.

Likely future actions within this planning area would include the proposed activities for the Deep Vegetation Management Project FSEIS. As with this project, all Heritage sites would be avoided during implementation of the Deep Vegetation Management Project FSEIS projects through project layout and design or protected during project implementation to achieve a finding of No Effect with the Oregon State Historic Preservation Officer (OSHPO).

Summary

Cultural resource management recommendations vary according to site type and conditions. Recommendations may direct operations to avoid lithic scatters or historic features and artifacts depending on site conditions and cultural features.

Table 27 displays proposed activities and the number of archaeological sites those activities could potentially affect by each alternative.

Table 27 – Number of Archaeological Sites Potentially Affected by Proposed Activities.

Proposed Activity	Alternative 1	Alternative 2 (Proposed Action)	Alternative 3
Road Decommissioning	0	16	23
Culvert Replacements	0	1	1
Spring Developments	0	1	1
Cutbank Revetments	0	0	1
Large Wood Placement and Exclosure Fences	0	1	1

Noxious Weeds

Existing Condition

The noxious weed species and populations within the watershed are low (Table 28). Forty-six (46) weed sites infest approximately 20 acres. Sites range from a few plants, to acres of scattered individuals. The largest and most concentrated infestations are presently being treated with herbicide as a separate project. Roads currently being treated include the 4200000, 4200470, 3000000, 425000 to the 425600 junction, 4256010, and 4250100. Species available for treatment along these roads is limited to the knapweeds. Other species and new infestations cannot be controlled with herbicides. Many small weed sites are located along roads parallel to Little Summit and Thornton Creeks. Some weeds are beginning to invade the surrounding native habitat. These creeks contain major populations of sensitive plants, notably, Peck's mariposa lily (*Calochortus longebarbatus* var. *peckii*). Canada thistle is of particular concern because it readily grows in riparian zones.

Table 28 – Noxious Weeds within the Deep Creek Watershed.

Scientific Name	Common Name
Cardaria draba	Whitetop
Centaurea diffusa	Diffuse knapweed
Centaurea maculosa	Spotted knapweed
Centaurea repens	Russian knapweed
Cirsium arvense	Canada thistle
Cynoglossum officinale	Common houndstongue
Dipsacus sylvestris	Teasel
Hypericum perforatum	St. John's-wort
Linaria dalmatica	Dalmatian toadflax
Potentilla recta	Sulfur cinquefoil

Of the weed infestations within the Deep Creek Watershed, the Russian knapweed, St. John's-wort, dalmatian toadflax and teasel populations are considered stable, and are not increasing at this time. The infestations being treated with herbicides are decreasing in size and number of plants. Untreated infestations of all other species are slowly increasing in size.

In addition to the weeds listed in Table 28, there are several noxious weed locations adjacent to the analysis area that have the potential to spread into the Deep Creek watershed. *Salvia aethiopis*, Mediterranean sage, and *Taeniatherum caput-medusae,* medusahead rye, are species with that potential. South of the watershed in the Roba and Paulina Creek drainages, is a large continuous infestation of common houndstongue. It is anticipated that this population will soon move into the Deep Creek Watershed and invade the Little Summit Creek drainage.

Environmental Effects

Introduction

Noxious weeds are invasive, aggressive, or harmful non-indigenous plant species (PNW Weed Management Strategy 1999). These species have the ability to displace native species. There are no known native biological agents for control. Noxious weeds reduce biological diversity, increase fire risk, poison livestock, and reduce wildlife forage quality. Most infestations begin on disturbed areas, such as roads, harvest landings, and recreation sites. The primary introduction of noxious weeds is through vehicles. Other sources of introduction and non-environmental spread

include hay used for feed, grazing and the use of heavy equipment. The desired condition for noxious weeds is to contain the current expansion of noxious weed infestations, prevent seed production by new infestations, and prevent noxious weed seed production on the Forest.

Effects analysis of the alternatives assumes that weed infestations covered under the 1998 Weed EA will continue to be treated with herbicide, as needed each year. Treatment of infestations not covered under the Weed EA would be treated by manual methods when that method is effective.

Over the last nine years the Paulina Ranger District has been averaging 38 new weed sites per year, and two new weed species per year, based on data since 1995. The noxious weed status within the Deep Creek Watershed is less than the District average. This may be due to the position of the watershed on the interior of the District, whereas heavily infested areas are adjacent to private land and the entrances to the forest. The rate of spread of existing sites depends on species and type of treatment. Weed sites treated with herbicides decline, weed sites left untreated increase, and those treated manually increase slowly or remain stable depending on the species (Paulina Weed Monitoring Database 2003).

The cumulative effects analysis area for noxious weeds is much larger than the Deep Creek Watershed. Vectors not confined to a watershed area, such as animals, wind, and human activity, transport weeds. The analysis will be based on the Ranger District and adjacent private and Forest Service administered lands.

Alternative 1 - No Action

Direct and Indirect Effects: This alternative has the least potential to spread or introduce noxious weeds. There would be no new disturbance from in-stream work or road closures.

The 12.6 acres of existing weed infestation included in the Weed EA would be treated with herbicides each year, and would continue to decrease in size. Of the remaining acres, the Russian knapweed, St. John's-wort, dalmatian toadflax and teasel populations would remain stable in the short term (3-5 years), in the long term these infestations would increase. The remaining 6.7 acres of untreated weed infestation would continue to spread through reproduction and disturbance, competing with native plants and reducing biodiversity. New weed sites would develop at somewhat less than the District average through vectors such as cattle, wildlife, vehicle travel, and forest recreationists.

Beneficial effects from the action alternatives would not be realized under this alternative. Healthy, vigorous native vegetation deters noxious weed growth. Closing and obliterating roads reduces the area in which vehicles are allowed to travel, reducing the risk of introducing new noxious weed infestations.

Cumulative Effects: The exact source of past infestations is unknown. The location pattern shows concentrated sites along the 4200470, 4250100 and 4256010 roads, which were developed during heavy disturbance, possibly timber harvest. The Aspen Timber Sale, 1985, and the Round Meadow Timber Sale, 1989, coincide with the heavy infestations. Other infestations are scattered along roads indicating introduction by forest users, and to a lesser extent, livestock. The Summit project, which included 2,234 acres of harvest concluded in 2001. In conjunction with harvest, 14.8 miles of road was built. Prescribed burning of 8,000 acres is on-going. This amount of disturbance (exposed soil and vehicle travel) cumulatively makes the probability of new weed infestations fairly high.

The Roba grazing allotment, south of the Deep Creek Watershed, has a growing houndstongue population. Cattle graze this area first, and then move to the Deep Creek Allotment, possibly bringing seed with them. Cattle and big game are becoming a substantially important vector in weed dispersal because of how houndstongue seed is spread. The Roba and Deep Allotments are being grazed together as one allotment, which increases the amount of cattle in any one pasture, therefore increasing the probability of weed introduction. Manual treatment is occurring to treat some of the houndstongue infestation; over 800 acres were treated in the last two years. In conjunction with this effort the west Roba pasture, where some of the heaviest infestations occur, was rested from grazing in 2002, 2003, and in 2004.

Cumulative impacts of travel on forest roads by visitors and forest workers would be detrimental to native vegetation through the spread of noxious weeds in the long-term. Human use on the forest is expected to increase in the future. Recreation use on Paulina Ranger District is currently increasing, especially from August through November during hunting season, and is expected to increase in the future as populations in nearby towns continue to grow. Late hunting season is a wet time of year, and is particularly conducive to weed spread due to mud clinging to tire tread. The green dot road permit policy helps limit access during the October through November hunting seasons.

The use of herbicide and biological control on new sites and species is not expected within the near future due to current litigation of vegetation management proposals within the Region. As a result of litigation, the Region 6 Competing and Unwanted Vegetation EIS has been deemed invalid due to the availability of newer herbicides and human risk factors. Therefore, a new EIS will need to be completed before site-specific treatment using herbicides or biological control is proposed at the District level. The Regional EIS and Forest level EIS are expected to be released in December 2005.

Alternatives 2 and 3

Direct and Indirect Effects: Vehicles and equipment have the largest potential to introduce new weed infestations and spread existing ones. This potential exists for most of the activities planned for both alternatives including: cutbank revetment, channel reconstruction, road closures, woody debris placement, headcut repair, spring developments, and culvert replacement. Both alternatives rate as high risk for the spread of noxious weeds. Although the project contains high-risk activities, the probability of spreading existing infestations or bringing new weeds in from outside the planning area is moderate to low when all prevention and mitigation measures are followed. Design criteria common to the action alternatives are outlined in Chapter 2 of the Deep Restoration EA. The risk of bringing in weeds from outside is proportional to the amount of activity and exposure to noxious weeds prior to coming on the District, or exposure during project activities.

Most of the risk of weed introduction from equipment is mitigated through design elements (prevention measures) that require cleaning before entering Forest Service administered land. Contracted heavy equipment such as excavators and walking backhoes would be free of weed seed, dirt and debris. This substantially reduces the risk of introducing new infestations. However, on-road vehicles are exempt from this requirement, and therefore still pose a risk. Forest Service heavy equipment and vehicles are another possible source of weed spread, especially when coming from other Districts and Forests where weeds may be prevalent. There are only five instances of activities occurring at noxious weed sites in Alternative 2, and four instances in Alternative 3. These infestations are small and design criteria would reduce the risk of spread.

The second largest potential for weed introduction and spread is by creating bare ground through soil disturbing activities. The increased risk of new weed establishment is proportional to the increase in disturbed soil. This is especially true along travel corridors. Alternative 2 would accomplish the most cutbank revetment and headcut repair, although the additional 13 miles of road decommissioning in Alternative 3 would create the barest soil.

Table 29 lists those activities that are of high-risk to the introduction and spread of noxious weeds, primarily due to exposed soil. Noxious weeds can quickly colonize bare soils. Material collection and transport includes gathering boulders, rock, trees, gravel, or soil from one area (off the site) and bringing it into another. Activities include headcuts, cutbank revetments, culvert replacement, rock fords, and large wood placement.

Table 29 - High Risk Activities for the Introduction and Spread of Noxious Weeds

	Alternative 1	Alternative 2	Alternative 3
Channel reconstruction/Pool habitat	0 acres	16 acres	5 acres
Culvert replacement adjacent to major roads	0	33	32
Road closure/decommission	0 miles	29 miles	45 miles
Material collection and transport	0 activities	116 activities	94 activities

Cumulative Effects: Cumulative effects for past and future actions are described under Alternative 1. Prevention techniques through design criteria and the current weed treatment program will help reduce increased cumulative effects of the Alternatives 2 and 3. The probability of either spreading or introducing noxious weeds depends upon the amount of ground disturbed, the level of risk associated with each project activity, the extent of present populations and vectors involved. Prevention is the best defense against noxious weeds. There are extensive prevention measures in place for the Deep Restoration Project. These in conjunction with current infestation treatment would reduce the probability of weed introduction. However, all management activities involve a level of risk that cannot be completely mitigated.

Range

Existing Condition

Overgrazing by sheep and cattle has contributed to loss of effective cover, bare soil, topsoil loss, soil compaction, stream bank degradation, and channel erosion. Degraded conditions have resulted in a loss of deeply rooted riparian vegetation and an increase in soil erosion rates, which have contributed to a reduction in desirable palatable forage species and a increase in undesirable species. Nonnative grasses and forbs species dominate many of these disturbed sites, invading when less resilient native plant species decline under grazing pressure. Many native shrub communities along streams have been degraded and have declined in distribution. Since regulating livestock grazing, many of the riparian and stream channel conditions have begun to improve (Soils report, Deep WA).

The Deep and adjoining Roba Allotments are used as a single allotment. The combination of these two allotments provides a five pasture rotating grazing system. With added numbers from Roba of 236 cow/calf pairs, there are periods when 436 cow/calf pairs graze the pastures. A riparian pasture fence was completed in Derr meadow in 2003, enclosing approximately 120 acres.

Deep Creek Watershed contains all or part of four grazing allotments (Table 30). Livestock control and distribution is primarily dependent on forage quality, location, and availability, fences, herding practices, water developments, salting, and pasture rotation. Resting pastures, reducing livestock numbers, and requiring full time riders have occurred in allotments or pastures that do not meet the 4-inch stubble height standard. The concerns/issues focus on extended use of riparian areas and affect riparian vegetation movement towards excellent condition as described in INFISH. It is not known to what extent that this standard has either achieved Riparian Management Objectives (RMOs) or maintained current levels of degraded aquatic habitat condition.

Available forage for domestic livestock use is expressed in terms of Animal Units (AU) or Animal Unit Months (AUMs) and is used to help determine livestock numbers. One AU is defined as a 1,000-pound mature cow with calf, or its equivalent. An AUM is based on the amount of forage required by one adult cow (approximately 780 pounds) for one month (26 pounds dry matter per day, Forest Plan).

The construction of new exclosures reduces the available forage base and a reduction in the number of permitted livestock. The reduction in permitted livestock would have a direct effect on the local economy, a reduction of approximately $7.50 per AUM available to the local economic base. AUMs are listed in Table 30**.**

Table 30 – Current Grazing Allotments Specifications within the Deep Creek Watershed.

Allotment	Acres	Permitted Cow/Calf Pairs	Permitted Use	AUMs	Economic Value ($)	Fences (Miles)	Water Developments
Deep Creek	17,581	200	6/16 to 9/30	713	5348.00	28	8
Derr	12,638	150	7/1 to 9/30	460	3450.00	19	5
Happy	18,630	230	6/21 to 9/30	782	5865.00	30	15
Little Summit	16,368	200	6/21 to 9/30	680	5100.00	21	6

Table 31 - Reduction in AUMs and Economic Value by Alternative for the Deep Restoration Project Area.

Alternative	AUMs (reduction)	Economic Value ($)
1	0	0
2	28	210.00
3	66	495.00

Environmental Effects

Introduction

Historic livestock grazing use has modified riparian habitats. Records indicate intensive unregulated sheep grazing in the Deep Creek Watershed area from 1880-1906. Livestock grazing became regulated, beginning in 1906 through the 1930s. Many of the allotments were converted from sheep to cattle in the early 1960s.

In areas where streams are unstable, there is potential to begin or continue down cutting,

effectively lowering the water table. This can cause a change in site conditions where soils dry out leading to a shift in vegetation composition from deeply rooted riparian species to shallow rooted less desirable ones (Whisenant 1999). This results in less forage production as well as exposing soils to accelerated erosion and potentially detrimental livestock impacts such as post holing, compaction, and bank shear.

The desired future condition for range is that forage production will be higher than at present due to improved range conditions and most riparian areas will be in excellent condition.

Alternative 1 - No Action

Direct and Indirect Effects: Existing land management practices would remain the same. Livestock grazing would continue to increase erosion and sediment yield by creating excessive post-holing, livestock trail development, and bank sloughing. Disturbances, such as soil displacement, would remain at current levels. Soil erosion and resulting sedimentation would continue at its current rate thereby reducing long-term productivity and forage production. No long-term benefits to the watershed or livestock forage production would occur.

Cumulative Effects: Historic livestock grazing significantly modified riparian habitats. Overuse in the Deep Creek Watershed riparian areas resulted in significant removal of riparian vegetation. The increase in bare soil and lack of soil holding root masses from riparian vegetation exposed stream banks to erosional forces during high peak flow events. Much of the productive riparian soils were lost, significantly changing the character, structure, and productivity of riparian zones and stream courses. Overgrazing by sheep and cattle has caused compaction, loss of effective cover, head cutting, post holing, and puddling. Large amounts of sediment have moved and are moving from these areas (Soils report, Deep WA).

Nonnative grasses and forbs species invade and now dominate many of these areas. These types of species invade disturbed sites when the less resilient native plant species decline under grazing pressure. These changes in species composition and structure degrade the quality of riparian habitats reducing effective ground cover and rooting depths. Many native shrub communities along streams have degraded and have declined in distribution. Since regulating livestock grazing, many of the riparian and stream channel conditions have begun to improve (Soils report, Deep WA).

Current livestock management involves pastures moves based on utilization standards (Pacfish/Infish 1995). This utilization standard involves a requirement of 4-inch stubble height along the riparian greenline at the end of the growing season. The objectives of this standard are to decrease incidental use on hardwoods, attain rooting strength along stream banks, and allow for sediment retention along the bankfull margin. Grazing permit actions such as resting pastures, reducing numbers, and requiring full time riders have occurred in allotments or pastures that do not meet the 4 inch stubble height standard. It is not known to what extent that this standard has either achieved Riparian Management Objectives (RMOs) or maintained current levels of degraded aquatic habitat condition.

Recent or ongoing activities within the watershed that have incrementally added to the condition described above include: SUDS 1992, Deep Salvage 1995, and Summit Prescribed Burn 1996, Domestic Livestock Grazing (4 allotments).

The Deep Vegetation Management Project FSEIS (2004) is an action in the near future, which could affect range resources in the Deep Creek Watershed in a positive manner. This project

proposes restoration projects that would promote healthier forest and riparian areas through such activities as road closures, prescribed burns, riparian planting, and meadow enhancement. These activities will help reduce the levels of erosion and increase soil productivity and forage.

The Paulina Ranger District is currently in the process of completing the Westside Allotment analysis and revising AMPs. The new AMPs are expected to improve riparian conditions, help stabilize soils, and increase forage.

Alternative 2 - Proposed Action

Direct and Indirect Effects: Under Alternative 2, unstable areas would be repaired and protected from livestock use allowing riparian vegetation to recover. These actions would have minimal impacts to the range resources in the short term, as the area affected is small. There are potentially long-term (> 2 yrs) beneficial improvements in forage production as water tables are stabilized or raised and desirable riparian vegetation recovers.

Under Alternative 2, approximately 36 miles of road are proposed for decommission or closure and 2.5 miles for reconstruction. Roads slated for decommission or closure would be ripped or scarified in order to breakup compacted soils, increase soil surface roughness and water infiltration rates (Branson et. al., 1972). These roads would then be seeded to establish vegetation cover on the soil surface. Approximately 52 acres of available forage (assuming 400lb/ac.) equaling nearly 21 AUMs would be created on these treated roads and available for livestock use.

Three livestock exclosures totaling approximately 123 acres are proposed in Alternative 2. These exclosures would protect riparian areas in less than desirable condition from livestock grazing allowing riparian vegetation to reestablish. This will afford protection to soil resources reducing soil erosion and improving natural resources condition. There is the potential to lose approximately 49 AUMs due to the construction of three livestock exclosures totaling 123 acres (assuming 400 lb./ac.) from annual production. This would be a short term consequence of Alternative 2, that has the possibility of changing in the long-term (> 5 yrs.) as the rangeland resource conditions in the exclosed areas improve and the need for continued livestock exclosure is reevaluated.

Five springs have been identified in action Alternative 2 for development. These springs would be fenced to exclude livestock, protect soil resources, and promote riparian vegetation recovery. Offsite watering sources for livestock would be developed in order to lower livestock use in the developed areas and provide available water. Short and long-term consequences to the rangeland resources would be minor as water would still be available for livestock use and the excluded areas would be small.

Cumulative Effects: Cumulative effects consider the combined effects of past, present, reasonably foreseeable, and proposed management actions. Historical livestock grazing programs have led to rangeland resources that were in poor condition due to overuse of the forage base, soil compaction and bank trampling. The present day grazing program has monitoring protocols that have helped improve the condition of rangeland resources, especially in the riparian areas.

Alternative 2 would have positive cumulative effects to rangeland resources in the short-term (<2yrs) and long-term (>2yrs). The potential loss of approximately 49 AUMs due to livestock exclosures is to some extent off set by an expected increase of approximately 21 AUMs resulting from the treatment of decommissioned and closed roads. Cumulatively this alternative has the potential to increase riparian vegetation and forage production over both the short and long-term,

of which Alternative 1 would not. Alternative 2 would result in a loss of approximately 28 AUMs compared to 63 AUMs in Alternative 3.

Alternative 2 (Proposed Action) proposes restoration on 44 headcut complexes (36.25 acres), 32 cutbank revetments (31.35 acres), 2 channel reaches (12.14 acres), 2.9 miles of large wood placement, and 36 culvert replacement/removals. These areas would be protected from livestock following restoration activities, allowing riparian vegetation to recover. These actions would have low impacts to the range resources in the short term as the area affected is small (approximately 80 acres) when compared to the total allotment acreage. There would be potential long-term (greater than 2 years) beneficial improvements in forage production as water tables are stabilized or raised and desirable riparian vegetation recovers.

Alternative 3

Direct and Indirect Effects: Under this alternative, unstable areas would be repaired and protected from livestock use allowing riparian vegetation to recover. These actions would have minimal impacts to the range resources in the short term, as the area affected would be small. There are potential long-term (> 2 yrs) beneficial improvements in forage production as water tables are stabilized or raised and desirable riparian vegetation recovers.

Under Alternative 3, approximately 47 miles of road are proposed for decommission or closure and 2.5 miles for reconstruction. Roads slated for decommission or closure would be ripped or scarified in order to breakup compacted soils, increase soil surface roughness and water infiltration rates (Branson et. al., 172). These roads would then be seeded to establish vegetation cover on the soil surface. Approximately 69 acres of available forage (assuming 400lb/ac.) equaling nearly 28 AUMs would be created on these treated roads and available for livestock use.

Four livestock exclosures totaling 226.6 acres are proposed in Alternative 2. These exclosures would protect riparian areas in less than desirable condition from livestock grazing allowing riparian vegetation to reestablish. This will afford protection to soil resources reducing soil erosion and improving natural resources condition. There is the potential to lose approximately 91 AUMs due to the construction of four livestock exclosures totaling 226.6 acres (assuming 400 lb./ac.) from annual production. This would be a short term consequence of Alternative 3, that has the prospect of changing in the long-term (> 5 yrs.) as the rangeland resource conditions in the exclosed areas improve and the need for continued livestock exclosure is reevaluated.

Seven springs have been identified in Alternative 3 for development. These springs would be fenced to exclude livestock, protect soil resources, and promote riparian vegetation recovery. Offsite watering sources for livestock would be developed in order to lower livestock use in the developed areas and provide available water. Short and long-term consequences to the rangeland resources would be minor as water would still be available for livestock use and the excluded areas are small.

The construction of one riparian pasture totaling 341.46 acres is proposed in Alternative 3. Riparian pastures allow for improved livestock utilization in areas with sensitive plant communities and soils. The greater control of livestock utilization gained thru the establishment of riparian pastures will benefit vegetation, soils, water as well as fish and wildlife habitat (Rangeland Watershed Program).

Resting pastures, reducing livestock numbers, and requiring full time riders have occurred in allotments or pastures that do not meet the 4-inch stubble height standard. The concerns/issues

focus on extended use of riparian areas and affect riparian vegetation movement towards excellent condition as described in INFISH. It is not known to what extent that this standard has either achieved Riparian Management Objectives (RMOs) or maintained current levels of degraded aquatic habitat condition.

Cumulative Effects: Alternative 3 would have positive cumulative effects to rangeland resources in the short-term (<2yrs) and long-term (>2yrs). The potential loss of approximately 91 AUMs due to livestock exclosures is to some extent off set by an expected increase of approximately 28 AUMs resulting from the treatment of decommissioned and closed roads. Cumulatively this alternative has the potential to increase riparian vegetation and forage production over both the

Activity	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3
Headcut Repairs	No improvement	Improvement*	Improvement*
Cutbank Revetments	No improvement	Improvement*	Improvement*
Road Treatments	No AUM increase	Additional 21 AUMs**	Additional 28 AUMs**
Spring Developments	No improvement	Improvement*	Improvement*
Channel Reconstruction	No improvement	Improvement*	Improvement*
Large Wood Placement	No improvement	Improvement*	Improvement*
Exclosures	No AUM loss/increase	Reduced 49 AUMs**	Reduced 91 AUMs **
Riparian Pastures	No improvement	No improvement	Improvement*
Culverts	No improvement	Improvement*	Improvement*
Pool Enhancement	No improvement	No improvement	Improvement*

Table 32 – The Effects to Range Conditions by Alternative and Activity
* Assumes recovery of surrounding vegetation
** Assumes 400lb/ac. Production

short and long-term, of which Alternative 1 would not. Alternative 3 would result in a loss of approximately 63 AUMs compared to 28 AUMs in Alternative 2. Table 32 compares the different effects to range by alternative and activity.

Economics

Table 33 summarizes the economic effects from each alternative. This table only estimates values on proposed activities and does not attempt to place a value on the possible benefits that may occur.

Table 33 – Economic Effects of the Alternatives

Activity	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3
Headcut Repair: $3,000 per headcut complex	$0	44 : $132,000	37 : $111,000
Cutbank Revetments: $3,000 per cutbank	$0	32 : $96,000	18 : $54,000
Culvert Replacements: $55,000 per culvert	$0	33 : $1.82 million	32 : $1.76 million
Channel Reconstruction: $60,000 per channel	$0	2 : $120,000	1 : $60,000
Spring Development: $2,500 per spring	$0	5 : $12,500	7 : $17,500
Grazing Exclosure: $2,500 per exclosure	$0	3 : $7,500	4 : $10,000
Riparian Pasture: $15,000 per pasture	$0	0 : $0	1 : $15,000
Road Closure: $2,500 per mile	$0	11.3 miles: $28,250	11.6 miles: $29,000
Road Decommission: $4,000 per mile	$0	19.0 miles: $76,000	29.0 miles: $116,000
Road Reconstruction: $8,000 per mile	$0	2.5 miles: $20,000	2.5 miles: $20,000
TOTAL	**$0**	**$2.31 million**	**$2.19 million**

Additional Disclosures

Tribal Interest

Members of the Confederated Tribes of the Warm Springs Reservation of Oregon continue to use the Ochoco uplands and hold off-Reservation treaty rights for fishing, hunting, gathering roots and berries, and pasturing livestock under the Treaty with the Tribes of Middle Oregon of 1855. Members of the Confederated Tribes of the Warm Springs, Burns Paiute, Umatilla, and Klamath Tribes use a wide variety of plant species that can be found within the project area. All alternatives would continue to provide for the rights afforded tribal members for taking fish, hunting, gathering roots and berries, and pasturing livestock on open and unclaimed land.

Environmental Justice

Under Alternative 1 current uses of National Forest lands would continue, including recreation, harvesting of non-forest products, special-use permits, subsistence uses, and spiritual/aesthetic uses. Effects to minority populations, disabled persons, and low income groups would not be disproportionate with other users of the National Forest.

The action alternatives provide a variety of opportunities for potential contracts. Opportunities to support employment and income would be available to all groups of people, subject to existing laws and regulations for set-asides, contract size, competition factors, skills, equipment, etc. Changes in access, due to decreases in open road miles, would occur under all action alternatives. Open road miles would be decreased by about 17 miles. These effects would occur for all user groups of the project area and would not have a disparate impact on any particular minority group.

Opportunities for all groups of people to collect forest products and participate in recreational activities would be maintained under all alternatives, and no disproportionate effect is anticipated to subsets of the general population. None of the alternatives would have disproportionately high and adverse environmental effects on minority populations, low-income populations, or Indian tribes.

Short-Term Uses and Long –Term Productivity

NEPA requires consideration of the "relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16).

The Multiple Use-Sustained Yield Act of 1960 requires the Forest Service to manage the National Forest System lands for multiple uses (including timber, recreation, fish and wildlife, range, and watershed). All renewable resources are to be managed in such a way that they are available to future generations.

Maintaining the productivity of the land is a complex, long-term objective. The action alternatives protect the long-term productivity of the project area through the use of Forest Plan standards and guidelines, mitigation measures/design elements, and best management practices. Long-term productivity would improve as a result of the various management activities proposed under the action alternatives and remain the same or continue to decline under the No Action Alternative.

Soil and water are two key factors in ecosystem productivity. These resources would be protected and enhanced under Alternatives 2 and 3. Sustained yield of timber, wildlife habitat, and other renewable resources all rely on maintaining long-term soil productivity. Water quality is expected to improve as a result of proposed restoration activities.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time, such as the temporary loss of timber productivity in forested areas that are kept cleared for use as a power line or road right-of-way.

No significant irreversible or irretrievable commitment of resources would occur with implementation of either Alternative 2 (Proposed Action) or Alternative 3. There would be some negligible irretrievable losses of fugitive dust caused by mechanical operations. There would be an irretrievable loss of soil over the long-term under Alternative 1 (No Action) as soil erosion and sedimentation would continue at accelerated rates.

Unavoidable Adverse Effects

Implementation of the action alternatives may result in some short-term environmental effects that cannot be completely mitigated or avoided if the proposal takes place. The application of Forest Plan standards and guidelines, BMPs, design elements and mitigation measures, followed by monitoring (refer to Chapter 2) are intended to minimize the extent, severity, and duration of these effects. The specific environmental effects based on significant issues are discussed earlier in this chapter by resource.

Headcut stabilization, cutbank revetments, spring developments, channel reconstruction, large wood placement, culvert replacements, replacing culverts with rock fords, and road closure, decommissioning, and reconstruction cause disturbance and have the potential for impacts. Implementation of the action alternatives would result in localized short-term increases in soil erosion and sedimentation but would promote long-term benefits to stream temperatures and reduce soil erosion and sedimentation. In all cases, the effects would be managed to comply with established legal limits.

Civil Rights, Women, and Minorities

There are no anticipated effects to these groups from implementation of any of the alternatives. To the greatest extent possible all members of the population of these groups have been provided the opportunity to comment before decisions are rendered on proposals and activities that may potentially affect them.

Prime Farmland, Rangeland, Forestlands

No prime farmlands, rangelands, or forestlands have been identified with the project area. Therefore, there would be no effect to these resources through implementation of any of the alternatives considered in this analysis.

Wetlands and Floodplains

The action alternatives would restore and have beneficial impacts to floodplains and wetlands (as described in Executive Orders 11988 and 11990) by improving channel conditions and restoring floodplain access.

Park Lands, Wild and Scenic Rivers, and Ecologically Critical Areas

No designated roadless areas exist within the watershed. Old growth stands, Wild and Scenic Rivers, and/or parklands would not be adversely affected by the proposed activities because there are no projects proposed within these areas.

Energy Requirements

There are no additional energy requirements for activities described in this analysis beyond those mentioned in the Forest Plan (FEIS 4-105). Activities on the Forest and Grassland which may have a positive net energy balance are firewood gathering and forage production. Generally, all other activities consume more energy than they produce.

Public Health and Safety

No significant adverse effects to public health and safety have been identified. All contractors and Federal employees who may be involved with project implementation would be required to meet Occupational Safety and Health standards (OSHA).

Highly Controversial Effects on the Human Environment

The effect of implementing the alternatives are well known, not highly controversial, and do not involve unique or unknown risks. The activities proposed under the action alternatives have been performed in the past and evaluated in terms of past successes and failures.

Potential Conflicts with Plans, Policies, and Other Jurisdictions

Implementation of Alternative 1 (No Action) could lead to a violation of State water quality standards in any given year because of continued and accelerated erosion. Alternative 2 (Proposed Action) or Alternative 3 are consistent with relevant Federal, State, and local laws, regulations, and requirements designed for the protection of the environment including the Clean Air and Clean Water Acts. None of the alternatives establishes a precedent for future actions or a decision in principle about a future consideration.

Cultural Resources with SHPO Concurrence

Surveys have been completed and concurrence has been documented with the State Historic Preservation Office (SHPO). Provision is made under the action alternatives for protection of new and relocated sites (Chapter 3, pages 71-73).

Forest Plan Consistency

Throughout this chapter, resource specialists have addressed Forest Plan standards and guidelines. Alternative 1 does not respond to water goals outlined in the Forest Plan or the Deep Water Quality Restoration Plan (WQRP, 2001) or lead toward the Desired Future Condition for water. Alternatives 2 and 3 are consistent with water quality goals outlined in the Ochoco National Forest Land and Resource Management Plan (LRMP, 1989) to 1) maintain or improve water quality, quantity, and timing of run-off, 2) comply with the objectives of the Clean Water Act and Oregon State water quality standards, and 3) provide water of consistently high quality to users and dependent resources (LRMP), page 4-35). This action further responds to the Desired Future Condition for water that states those watersheds not presently in good condition will be scheduled for improvements, of which may take decades before the entire watershed and riparian areas are fully functional again (LRMP, page 4-36). Riparian goals with the Inland Native Fish Strategy (INFISH, 1995) are to 1) maintain or restore water quality to a degree that provides for stable and productive riparian and aquatic ecosystems, 2) maintain or restore stream channel integrity, channel processes, and the sediment regime, and 3) maintain or restore instream flows to support healthy riparian and aquatic habitats and route flood discharges. Proposed actions also respond to the goals of the Deep Water Quality Restoration Plan (WQRP, 2001) to 1) reduce stream temperatures on 303 (d) listed streams, 2) maintain and improve riparian habitat conservation areas (RHCAs) so that streams approach their maximum site potential for vegetation and shade, 3) improve aquatic habitat potential and bank stabilization through recovery of riparian vegetation and placement of large wood, and 4) restore channel form and flow regime to mitigate elevated stream temperatures and degraded habitat (WQRP, pages 27-28). Prioritization

of proposed projects are in conformity with those outlined in the Deep Creek Watershed Analysis pages 75 78, 1999.

Chapter 4

Consultation and Coordination

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this Environmental Assessment.

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Glossary of Acronyms, Abbreviations, and Terms

Airshed - A geographical area that because of topography, meteorology, and climate shares the same air.

Alternative - In an EA/EIS, one of a number of possible options for responding to the purpose of and need for action.

AMP - Allotment Management Plan

Arterial Road - Roads comprising the basic access network for National Forest System administrative and management activities. These roads serve all resource to a substantial extent, and maintenance is not normally determined by the activities of any one element. They provide service to large lands areas and usually connect with public highways or other Forest arterial roads to form an integrated network of primary travel routes. Usually they are developed and operated for long-term land and resource management purposes and constant service.

AUM - Animal unit month; based on the amount of forage required by an animal unit for one month (26 pounds dry matter per day, Forest Plan).

BA - Biological Assessment

BE - Biological Evaluation

Best Management Practices (BMPs) - Practices designed to prevent or reduce water pollution, including sedimentation.

BLM - Bureau of Land Management

BMP – see Best Management Practices

Canopy - In a forest, the branches from the uppermost layer of trees; in a shrub or grassland, the uppermost layer of shrubs; in a riparian area, the layers of vegetation that project over the stream.

Canopy Cover – The areas of the ground covered by a vertical projection of the canopy. Used to describe how open or dense a stand of trees is, often expressed in 10 percent increments.

CFR – Code of Federal Regulations.

Closed Road – Generally, local roads that are physically closed (signs, gates, and earthen berms) to public use.

Collector Road - Roads that serve smaller lands areas than a Forest arterial road, and usually connected to an arterial road or public highway. These roads collect traffic from local Forest roads and/or terminal facilities. The location and standard are influenced by both long-term multi-resource service needs, as well as travel efficiency. These roads may be operated for either constant or intermittent service, depending on land use and resource management objectives for the area.

Compaction - Packing together soil particles by exerting force at the soil surface and increasing soil density. Making soil hard and dense, decreasing its ability to support vegetation because the soil can hold less water and air and because roots have trouble penetrating the soil.

Connectivity - The arrangement of habitats that allows organisms and ecological processes to move across the landscape; patches of similar habitats are either close together or linked by corridors of appropriate vegetation (the opposite of fragmentation).

Cover - (1) Trees, shrubs, rocks, or other landscape features that allow an animal to partly or fully conceal itself. (2) The area of ground covered by plants, litter, and coarse fragments, including tree crowns and shrubs that are in direct contact with the ground.

Heritage Resources - The remains of sites, structures, or objects used by humans in the past. They may be historic, prehistoric, archaeological, or architectural in nature.

Cumulative Effects - Impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively major actions taking place over a period of time.

Cutbank Revetment - A structure that consists of rocks, logs, rootwads, or other debris that is used to stabilize an exposed streambank.

CWE – Cumulative Watershed Effects; substantial, adverse influences on water quality and biological resources that arise from the way watersheds function, and particularly from the ways that disturbances within a watershed can be transmitted and magnified within channels and riparian habitats downstream of disturbed areas.

Decommissioned (Road) - A road that is no longer needed and not planned to be used again. It has been closed and, generally, has been returned to production (example: a road that has been ripped/(tilled and planted with vegetation).

Design Elements – measures taken to reduce the potential for negative impacts on a resource from a project activity.

Detrimental Soil Conditions – There are four categories describing detrimental soil conditions: compaction, displacement, puddling and severely burned soil or charring. Compaction is defined as an increase in soil bulk density of 20% or more from the undisturbed level for volcanic ash soils and 15% or more for residual soils. Displacement is often described as the removal or mixture of topsoil or humus from the A horizon. Puddling is the breakdown of soil structure under wet conditions. Severely burned soil or charring can be described as having the top layer of mineral soil greatly changed in color, usually to red, and the next one-half inch blackened from organic matter charring by heat conducted through the top layer.

Developed Recreation - Recreation that requires facilities that in turn result in concentrated use of an area; for example, a campground.

Dimension - A term that refers to the cross-sectional profile of a stream.

Direct Effects - Impacts on the environment that are caused by an action and occur at the same time and place.

Dispersed Recreation - Recreation that does not occur in a developed recreation sites; for example, hunting or backpacking.

Diversity - The distribution and abundance of different plant and animal communities and species within an area.

EA – Environmental Assessment

Ecosystem - A complete, interacting system of living organisms and the land and water that make up their environment; the home places of all living things, including humans.

EHA - see Equivalent Harvest Area

EIS - see Environmental Impact Statement

Endangered Species - A plant or animal species listed under the Endangered Species Act that is in danger of extinction throughout all or a major portion of its range.

Endangered Species Act (ESA) - An act, passed by Congress in 1973 that directed all Federal departments and agencies to seek to conserve endangered and threatened species. Actions authorized, funded, or carried out by Federal departments and agencies should not jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitat. The act also mandates conferencing with the appropriate agencies.

Environment - The combination of external physical, biological, social, and cultural conditions affecting the growth and development of organisms and the nature of an individual or community.

Environmental Consequences – Effects as a result of an action. Included are direct effects, which are caused by the action and occur at the same time and place; indirect effects, which are caused by the action and are later in time or further removed in distance but which are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and the related effects on air, water, and other natural systems, including ecosystems. Effects may also include those resulting from actions that may have both beneficial and detrimental effects, even if, on balance, the agency believes the effects will be beneficial.

Equivalent Harvest Area (EHA) - That area which when harvested under any of the various silvicultural regimes produces hydrological effects similar to one acre of clearcut.

Erosion – The detachment and removal of soil material from its original location.

Exclosure - A structure, generally a fence, that prohibits cattle and/or wildlife from a designated area.

Fire Regime - The characteristics of fire in a given ecosystem, such as the frequency, predictability, intensity, and seasonality of fire. Fire regimes can be grouped into three severity regimes: Nonlethal, Mixed, and Stand Replacement. Nonlethal fires are of low to moderate intensity, creeping, surface fires that consume primarily understory grasses, forbs, and shrubs, and leave the overstory trees intact. Stand replacement fires are of high intensity and consume most of an existing stand. Mixed fires are of moderate intensity and consume the understory and some of the overstory.

Ford - A term used for a developed stream crossing, by which there is no culvert or bridge.

Forest Plan (Land and Resource Management Plan) - A document that guides natural resource management and establishes standards and guidelines for a National Forest; required by the National Forest Management Act.

Forest Plan Amendment #2 (aka Regional Forester's Interim Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales or Eastside Screens) - Originally signed in 1994 and amended in 1995. The objective of this direction was to provide an approach for maintaining future planning options concerning wildlife habitat associated with late and old structural stages, fish habitat, and old forest abundance. The direction was intentionally restrictive, reflecting a conservative interpretation of riparian, wildlife, and ecosystem needs for the short term. The direction applies to timber sales. The Interior Columbia Basin Ecosystem Management Project will supercede the Eastside Screens.

Fragmentation (habitat) - The breakup of a large land area (such as a forest) into smaller patches isolated by areas converted to a different land type (the opposite of connectivity).

FS - Forest Service

FSM – Forest Service Manual

Fuels – Includes living plants; dead, woody vegetative materials; and other vegetative materials capable of burning.

General Forest Management Area – see Management Area

Ground Cover - Perennial vegetation plus litter and coarse fragments (greater than 2 mm in size), including tree crowns and shrubs, that are in direct contact with the ground. Based on the erosion hazard class, effective ground cover is between 20% and 75% of ground covered the first year after management activities.

Gully - An erosional term used to describe concentrated erosion in the vertical direction. Gullies are generally deeper than they are wide.

Habitat - A place that provides seasonal or year-round food, water, shelter, and other environmental conditions for an organism, community, or population of plants or animals.

Headcut - A term used to describe a gully or vertical jump within a stream. Headcuts generally continue to downcut and migrate upstream over time.

IDT - Interdisciplinary Team

Inactivated (Road) - A road that is managed in a stored or closed category for long-term intermittent use. Generally, a traffic service level D single purpose type road that remains open to motorized off-highway vehicles. An inactivated road can be hydrologically stabilized or hydrologically closed.

Indirect Effects - Impacts on the environment that are caused by an action and are later in time or farther removed in distance.

INFISH - Interim Inland Native Fish Strategy for the Intermountain, Northern, and Pacific Northwest Regions (Forest Service). A strategy intended to provide interim direction to protect habitat and populations of resident fish outside of anadromous fish habitat in eastern Oregon, eastern Washington, Idaho, western Montana, and portions of Nevada. The Decision Notice/Finding of No Significant Impact for this strategy was signed July 28, 1995.

Instream Structures – Boulders, logs, or other artificially placed materials that are used to enhance or improve existing fish habitat by altering stream velocity and depth or to provide physical cover.

Interdisciplinary Team (IDT) - A team of people that collectively represent several disciplines and whose duty it is to coordinate and integrate the planning process.

Intermittent Stream - A stream that flows only at certain times of the year when it receives water from other streams or from surface sources such as melting snow.

Irretrievable - A category of impacts that applies to losses of production or commitment of renewable resources. For example, while a linear piece of land is being used as a road, some or all of the timber production there is "irretrievably lost." If the road was rehabilitated after use and soil compaction was reduced, timber production could resume; therefore, the loss of timber production during the time the road was in use is irretrievable but not irreversible, because it is possible for timber production to resume if the piece of land is no longer used as a road.

Irreversible - A category of impacts that applies to non-renewable resources, such as minerals and archaeological sites. Losses of these resources cannot be reversed. Irreversible effects can also refer to effects of actions on resources that can be renewed only after a very long period of time, such as the loss of soil productivity.

Issue - A matter of controversy, dispute, or general concern over resource management activities or land uses. To be considered a "major " or "key" issue, it must be well defined, relevant to the proposed action, and within the ability of the agency to address through alternative management strategies.

Jump - A vertical transition within a stream that may prevent fish passage.

Landtype – An inventory map unit with relatively uniform potential for a defined set of land uses. Properties of soils, landform, natural vegetation, and bedrock are commonly components of landtype delineation used to evaluate potentials and limitations for land use.

Late and Old Structure (LOS*)* - Late and old structure forested stands. See Late Successional and Old Structured.

Listed Species - A wildlife or plant species listed under the authorization of the Endangered Species Act as threatened or endangered.

Listed (Streams*)* – Streams listed on the 303(d) List by Oregon Department of Environmental Quality (ODEQ) as water quality limited.

Local Road - Local roads are usually one-lane roads constructed to serve a dominant use or resource. Local roads do not access large land areas since they are more site-specific than arterial and collector roads.

LOS - see Late/Old Structure

LRMP - Land & Resource Management Plan (see Forest Plan)

MA - Management Area; a unit of land allocated to emphasize a particular resource, based on the capability of the area.

Management Direction - A statement of goals and objectives, management prescriptions, and associated standards and guidelines for attaining them.

Management Indicator Species (MIS*)* - Vertebrate species whose population changes are believed to best serve as an index of a biological community's response to the effects of land management activities or are important for fishing, hunting and trapping.

MIS – see Management Indicator Species

Mitigation - Measures designed to counteract environmental impacts or to make impacts less severe.

National Environmental Policy Act (NEPA) - An act, passed by Congress in 1969 that declared a national policy to encourage productive harmony between humans and their environment. This act requires the preparation of environmental impact statements for Federal actions that are determined to be of major significance (see 40 CFR [Code of Federal Regulations] 1500-1508 for implementing regulations. See also FSH [Forest Service Handbook] 1909.15, the FS Environmental Policy and Procedures Handbook.)

NEPA - see National Environment Policy Act

NLAA - Not Likely to Adversely Affect

NMFS - National Marine Fisheries Service

NRHP – National Register of Historic Places

No Action Alternative - The most likely condition expected to exist in the future if current management direction were to continue unchanged.

Non-forest Land – Lands that have never had or that are incapable of having 10% or more of the area occupied by forest trees, or lands previously having such cover and currently developed for non-forested use.

ODEQ – Oregon Department of Environment Quality

ODFW - Oregon Department of Fish & Wildlife

Old Structure - A forest stand with moderate to high canopy closure; a multi-layered, multi-species canopy dominated by large overstory trees, high incidence of large trees, some with broken tops and other indications of old decaying wood (decadence), numerous large snags; and heavy accumulations of downed wood. For ponderosa pine stands, large diameter trees with incidences of snags and old decaying wood may indicate old structure. Canopy densities may actually be low with fewer trees per acre present than other plant associations.

OSHA - Oregon Occupational Safety & Health Association

Overstory - The upper canopy layer of trees.

PACFISH – Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (commonly referred to as PACFISH).

Pattern - A term that refers to the plan-view of a stream.

PBA - Programmatic Biological Assessment

PDC - Project Design Criteria

Perennial - A plant that lives for three or more years.

Perennial Stream - A stream that flows water year round.

PFA - Post Fledgling Area

Plant Associations - Climax plant community type.

Plant Association Group (PAG) - A group of plant associations that share similar productivities, disturbance regimes, and responses to disturbance. Eight major plant association groups have been described on the Ochoco National Forest.

Plant Communities - A homogeneous unit in respect to the number and relationship of plants in tree, shrub, and ground cover strata.

Prescribed Fire – A wildland fire burning under specified conditions that will accomplish certain planned objectives. The fire may result from either planned or natural ignitions. The Regional Forester must approve proposals for use of natural ignitions for this purpose.

Post-holing - A term used to describe soil disturbance from wildlife and livestock that results in "post-hole like" depressions.

Profile - A term that refers to the longitudinal profile of stream.

Proposed Action - A proposal made by the Forest Service to authorize, recommend, or implement an action on National Forest System lands to meet a specific purpose and need.

Puddling – A term used to describe standing water on the soil surface resulting from platiness or lack of structure.

Rager Green Dot Road Closure – a wildlife management tool, used on the Paulina Ranger District (Rager Ranger Station), where certain forest roads and the adjacent area within 300 feet of those roads are closed to public vehicular traffic during periods of restrictions. Closure begins three days prior to General Deer Season.

RHCA - see Riparian Habitat Conservation Area

Riparian Area - An area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation.

Riparian Habitat Conservation Area (RHCA*) -* A portion of a watershed where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. RHCA include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems by (1) influencing the delivery of coarse sediment, organic matter, and woody debris to streams, (2) providing root strength for channel stability, (3) shading the stream, and (4) protecting water quality.

RMO - Riparian Management Objectives

Scoping - The early stages of preparation of an environmental assessment or environmental impact statement used to solicit public opinion, receive comments and suggestions, and determine the issues to be considered in the development and analysis of a range of alternatives. Scoping may involve public meetings, telephone conversations, mailings, letters, and other contacts.

SDI - Stand Density Index

Sediment - Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity or ice and has come to rest on the earth's surface either above or below sea level.

Sedimentation – The action or process of forming or depositing sediments.

Sediment Yield – Sediment that is eroded from adjacent land into a body of water.

Sensitive Species - Species identified by a Regional Forester for which population viability is a concern because (a) of substantial current or predicted downward trends in population numbers or density, or, (b) of substantial current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Seral Stage – A plant or animal community that is transitional in stage of succession, being either short- or long-term. If left alone, the seral stage will pass and another plant or animal community will replace it.

Short-Term Effects – For timber management planning, those effects which will not be substantial beyond the RPA planning horizon of 50 years. For DEQ water quality, short-term effects are defined as two days or less. Generally, short-term effects are within the planning period.

SHPO - State Historic Preservation Officer.

Silviculture - The practice of manipulating the establishment, composition, structure, growth, and rate of succession of forests to accomplish specific objectives.

Species - A population or series of populations of organisms that can interbreed and reproduce freely with each other but not with members of other species.

Spyder - Piece of machinery that has been designed to maneuver in narrow spaces and on steep slopes while maintaining low impacts to soils.

Stand - A group of trees in a specific area that is sufficiently alike in composition, age, arrangement, and condition to be distinguishable from the forest in adjoining areas.

Stream Class - A classification system for streams. **Class I** are perennial or intermittent streams containing one or more of the following characteristics: (1) are the direct source of water for domestic use; (2) are used by large numbers of fish for spawning, rearing, or migration; and/or (3) contain enough flow to have a major influence on water quality of a Class I stream. **Class II** are perennial or intermittent streams containing one or more of the following characteristics: (1) are used by moderate numbers of fish for spawning, rearing, or migration; and/or (2) flow enough water to have a moderate influence on downstream quality of a class I or II stream. **Class III** are all other perennial streams not meeting Class I or II definitions. **Class IV** are all other intermittent streams not meeting Class I, II, or III definitions.

Subwatershed - An area mostly bounded by ridges or other similar topographic features contributing water, organic matter, dissolved nutrients, and sediments to a lake or stream. One or more subwatersheds make up one watershed.

Succession - A series of dynamic changes by which one group of organisms succeeds another through stages leading to potential natural community or climax. An example is the development or series of plant communities (called seral stages) following a major disturbance.

Threatened Species - Species listed under the Endangered Species Act that are likely to become endangered within the foreseeable future throughout all or a major portion of their range.

TMDL - Total Maximum Daily Load

Understory – May include grass, forbs, shrubs, small trees (such as seedlings and saplings), and other plants found beneath the overstory tree canopy.

USDA - United States Department of Agriculture.

USDI - United States Department of Interior.

USFWS - United States Fish & Wildlife Service

Watershed – An area mostly bounded by ridges or other similar topographic features contributing water, organic matter, dissolved nutrients, and sediments to a lake or stream. A watershed is made up of two or more subwatersheds.

WEPP – Water Erosion Prediction Project; a model to estimate potential soil erosion and sediment yield.

W/D - Width to Depth Ratio

WQRP - Water Quality Restoration Plan

Xeric – Of, characterized by, or adapted to an extremely dry habitat.

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Appendix A

Comments Received, Responses To, and Issues Identified During the Scoping Process

Public Responder	Concern/Issue	Response
Letter 1: Ochoco Lumber Company – John Morgan	1-1. Try to get restoration activities done during low stream flows.	The Interdisciplinary Team (IDT) agrees with your comment. All restoration work will be done during periods of low stream flow as regulated by the Oregon Department of Fish and Wildlife's in-stream work guidelines.
	1-2. Keep delay times to a minimum.	All activities will be implemented so as to keep delay times to a minimum.
Letter 2: Ray Spencer	No concerns	NA
Letter 3: Harold Shepherd	3-1. Livestock grazing impacts analysis.	The impacts to the project area from livestock grazing will be analyzed under the cumulative effects analysis within the EA.
	3-2. Livestock management including removal of livestock from riparian areas.	A decision regarding a change in the management of livestock is outside the scope of this project. Management of livestock will be addressed in an out-year Allotment Management Plan (AMP) update.
Letter 4: The Confederated Tribes of the Warm Springs Reservation of Oregon (CTWS)- Fara Ann Currim	4-1. Lack of riparian vegetation and subsequent degradation of the stream channel.	Riparian vegetation treatments are not proposed within this EA, hence are outside the scope of this project. Riparian vegetation is addressed for the same project area within the Deep FSEIS. Grazing impacts to vegetation will be addressed within the cumulative effects analysis.
	4-2. A change or revision of cattle season of use would undoubtedly affect the growth and diversity of riparian vegetation.	A decision associated with the management of livestock is outside the scope of this project. Any changes or revisions to the cattle season of use would be addressed in an out-year AMP update.
	4-3. The CTWS would prefer to see the allotment management plans	The timing of restoration activity implementation and allotment management plan completion is

	completed and the associated land management changes in place prior to restoration activities.	outside the scope of this project.
	4-4. A comparison study of in stream restoration vs. change in management would be useful in determining the effectiveness of active restoration activities	The request for additional research is outside the scope of this project.
Letter 5: Chuck Hedges	5-1. Commercial or precommercial timber harvest within Riparian Habitat Conservation Areas (RHCAs) and uplands to provide long-term healthy stands. Prescribed fire should also be used in conjunction with timber harvest.	Long-term proactive riparian management tools such as commercial and precommercial harvest and prescribed fire are outside the scope of this project. These tools are addressed for the same project area within the Deep FSEIS.
	5-2. Early season intensive, short-term livestock grazing system in the planning areas RHCAs.	A decision regarding the management of livestock is outside the scope of this project and will be addressed in an out-year AMP update.
	5-3. Develop a trail system that connects people to their stream if you are closing roads.	The IDT is not proposing to prohibit public access, but instead to change the access to protect resources. Access to streams will still be available to the public.
	5-4. Maintain or improve dispersed campsites so that they don't degrade riparian areas.	The IDT agrees with your comment, however dispersed campsite treatments are not proposed within this EA. Dispersed campsite treatments are addressed for the same project area within the Deep FSEIS.
Letter 6: Grant County Conservationists – Linda Driskill	6-1. In regards to connectivity, we need to know what you are connecting, why and how?	The Paulina Ranger District is proposing to restore connectivity for fish and amphibian passage to available suitable habitat. This would meet the purpose and need of this project. This would be accomplished by resizing culverts, repairing headcuts, and other restoration

		activities within the proposed action.
	6-2. Protect areas of high ecological integrity (i.e. resource natural areas, wilderness, rare plant communities, or any area that has been recognized as unique.	The IDT has recognized the effects to high ecological integrity areas, especially sensitive plants, as an ***issue***, which will be tracked through this EA.
	6-3. Activities (clarified to be "grazing" on 8/19/03) that have been determined by a restoration assessment to impede natural recovery processes must cease.	A decision regarding a change in livestock management is outside the scope of this project and will be addressed in an out-year AMP update.
	6-4. I am nervous about the achievement of an INFISH standard through the mechanical placement of large wood (or other artificial engineering solutions).	Achievement of INFISH standards through the mechanical placement of large wood (or other artificial engineering solutions) will be discussed within the effects analysis of the EA.
	6-5. Planting of 40,000 hardwoods for future shade, my experience has been that this activity achieves limited success.	Riparian vegetation treatments are not proposed within this EA, hence are outside the scope of this project. Riparian vegetation is addressed for the same project area within the Deep FSEIS.
	6-6. Treatment of "encroaching" conifers around meadows.	Treatment of "encroaching" conifers around meadows is not proposed within this EA, hence is outside the scope of this project. Treatment of conifers is addressed for the same project area within the Deep FSEIS.
	6-7. Cutting in RHCAs.	Cutting within RHCAs is not proposed within this EA, hence is outside the scope of this project. Cutting in RHCAs is addressed for the same project area within the Deep FSEIS.
	6-8. Livestock Management.	A decision regarding a change to the management of livestock is outside the scope of this project and will be addressed in an out-year AMP update.

	6-9. Beaver Restoration.	The management of beaver is outside the scope of this project.
Letter 7: Bar Shoe Valley Ranch – Bill Sanowski	7-1. What impact does the present day fishing limits have on the existing fish in Deep Creek and are they enforced? Maybe fishing should be stopped for 5 years?	Regulation and management of the fish populations within Deep Creek are administered by the Oregon Department of Fish and Wildlife. Hence, this comment is outside the scope of this project.
	7-2. What impact does recreation have on fish and water quality?	The IDT has recognized recreation to be impacting fish and water quality. However, addressing recreation is outside the scope of this project and is addressed for the same project area within the Deep FSEIS.
	7-3. What impact does timber harvest have on fish and water quality?	Timber harvest will be addressed within the cumulative effects analysis for this project. However, timber harvest is not proposed within this EA, hence is outside the scope of this project. Timber harvest is addressed for the same project area within the Deep FSEIS.
	7-4. What impact has 150 years of grazing had on streams and are there new grazing prescriptions for this area?	The impacts from livestock grazing will be analyzed under the cumulative effects analysis within the EA. However, a decision regarding the management of livestock is outside the scope of this project and will be addressed in an out-year AMP update.
	7-5. What impact does the present road following the stream channel have on bank stability, and how does it favor or disfavor fish mortality, streambank stabilization, and riparian vegetation enhancement?	The IDT has recognized the effects to fish and water quality as an ***issue***, which will be tracked through this EA.
	7-6. The effects to resources from the type of equipment used for restoration activities.	The selected piece of equipment will be based on the type of equipment that will have the lowest resource damage and be capable of maneuvering in constricted locations. However, the effects of proposed actions to soils and water quality have been recognized by

		the IDT as an ***issue***, which will be tracked through the EA.
	7-7. Number and maintenance of exclosures.	The IDT agrees with your concern on maintenance of exclosures. All exclosures will have an identified purpose and maintenance will be identified.
	7-8. No mention has been made as to the use of live woody materials for bank stabilization.	The use of live woody materials for bank stabilization is not proposed within this EA, hence is outside the scope of this project. It is, however, addressed for the same project area within the Deep FSEIS.
	7-9. Does Deep Creek Qualify for the Inland Native Fish Strategy (INFISH)?	Yes.
	7-10. Are the people that are going to plan and manage the work qualified in education and experience to assure quality implementation?	Yes.
	7-11. Are the permittees going to have any input on modifications? Are they part of the planning team? Part of the IDT?	The permittees are included on the public scoping list, hence can be involved in the planning process. The public may also review and make recommendations on the review document.

The internal issues that were developed by the IDT are as listed below.

Dave Palmer	I-1: Soil erosion due to stream restoration activities	The IDT has recognized this as an ***issue***, which will be tracked through this EA.
Mike Feiger	I-2a: Concerns for Wildlife movement and access to habitat due to fence exclosures	Determined not to be an issue. The fence would be a short-term fence (5-7 years), which would not prevent access to summer/winter ranges but change access. Also, there is other suitable habitat within the area.

Dave Palmer	I-2b: Purpose and maintenance of fence exclosures	Determined not to be an issue. All exclosures will have an identified purpose and maintenance will be identified.
Kathleen Martin	I-3: Surface and subsurface soil disturbance (to archaeological sites) from spring developments, channel reconstruction, culvert pulling and road activities.	Determined not to be an issue. With appropriate management practices in place, effects to archaeological areas would be avoided.
Kathleen Martin	I-4: Access to traditional resource gathering areas due to road closures	Determined not to be an issue. With appropriate management practices in place, access to traditional gathering areas would not be prohibited, but instead the mode of access would be changed.
Deb Mafera	I-5: The potential for introduction and spread of existing noxious weed populations.	Determined not to be an issue. With appropriate management practices in place, the potential for the introduction and spread of noxious weeds would be minimized.
Rob Tanner	I-6: The effects to water quality due to restoration activities.	The IDT has recognized this as an ***issue***, which will be tracked through this EA.
Rob Tanner	I-7: The effects to fisheries due to restoration activities.	The IDT has recognized this as an ***issue***, which will be tracked through this EA.
Dave Palmer	I-8: The impacts to grazing permit administration.	Determined not to be an issue. With appropriate management practices in place, the potential for impacts to grazing permit administration would be minimized.
Mike Feiger	I-9: The effects to amphibians due to restoration activities.	Determined not to be an issue. With appropriate management practices in place, the potential for effects to amphibians would be minimized.
Deb Mafera	I-10: The effects to sensitive plants due to restoration activities.	The IDT has recognized this as an ***issue***, which will be tracked through this EA.

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Appendix B

Summary of Determinations from the Fisheries, Wildlife, and Botany Biological Evaluations (BE)

TE&S Species Biological Evaluation Summary of Conclusion of Effects

SPECIES	ALT 1	ALT 2	ALT 3
1. Bull Trout	NE	NE	NE
2. Redband Trout	BI	BI	BI
3. Mid-Columbia Steelhead	NE	NE	NE
4. Chinook Salmon – Essential Fish Habitat	NE	NE	NE
5. Westslope Cutthroat Trout	NE	NE	NE
6. Malheur Mottled Sculpin	NE	NE	NE
7. Blue Mountain Cryptochian Caddisfly	NE	NE	NE
5. Northern Bald Eagle	NE	NE	NE
6. Canada Lynx	NE	NE	NE
7. American Peregrine Falcon	NI	NI	NI
8. Bufflehead	NI	NI	NI
10. Upland Sandpiper	NI	NI	NI
11. Tricolored Blackbird	NI	NI	NI
12. Western Sage Grouse	NI	NI	NI
13. California Wolverine	NI	NI	NI
14. Pygmy Rabbit	NI	NI	NI
15. Columbia Spotted Frog	NI	MIIH	MIIH
16. Achnatherum hendersonii	NI	NI	NI
17. Achnatherum wallowensis	NI	NI	NI
18. Artemisia ludoviciana ssp. estesii	NI	NI	NI
19. Astragalus diaphanus var. diurnus	NI	NI	NI
20. Astragalus peckii	NI	NI	NI
21. Astragalus tegetarioides	NI	NI	NI
22. Botrychium ascendens	NI	MIIH	MIIH
23. Botrychium crenulatum	NI	MIIH	MIIH
24. Botrychium minganense	NI	MIIH	MIIH

25. Botrychium montanum	NI	MIIH	MIIH
26. Botrychium paradoxum	NI	MIIH	MIIH
27. Botrychium pinnatum	NI	MIIH	MIIH
28. Calochortus longebarbatus var. longebarbatus	NI	NI	NI
29. Calochortus longebarbatus var. peckii	NI	WIFV	MIIH
30. Carex backii	NI	NI	NI
31. Carex hystercina	NI	MIIH	MIIH
32. Carex interior	NI	MIIH	MIIH
33. Carex stenophylla	NI	NI	NI
34. Cypripedium parviflorum	NI	NI	NI
35. Camissonia (Oenothera) pygmaea	NA	NA	NA
36. Lomatium ochocense	NA	NA	NA
37. Mimulus evanescens	NA	NA	NA
38. Penstemmon peckii	NA	NA	NA
39. Rorippa columbiae	NA	NA	NA
40. Thelypodium eucosmum	NA	NA	NA
41. Thelypodium howellii ssp. howellii	NA	NA	NA

NE	No Effect
LAA	Likely to Adversely Affect
NLAA	Not Likely to Adversely Affect
BE	Beneficial Effect
NLJ	Not Likely to Jeopardize the Continued Existence of the Species or Result in Destruction or Adverse Modification of Proposed Critical Habitat.
LJ	Likely to Jeopardize the Continued Existence of the Species or Result in Destruction or Adverse Modification of Proposed Critical Habitat.
NI	No Impact
MIIH	May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Loss of Viability to the Population Or Species
WIFV*	Will Impact Individuals or Habitat with a Consequence that the Action May Contribute to a Trend Towards Federal Listing or Cause a Loss Of Viability to the Population or Species
BI	Beneficial Impact
N/A	No Habitat or Species Present

***Trigger For A Significant Action As Defined in NEPA**

****Note: Rationale For Conclusion of Effect Is Contained In The NEPA**

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Appendix C

Riparian Habitat Conservation Areas (RHCAs) by Stream Class

The entire planning area follows the Forest Plan standards and guidelines and interim widths for RHCAs. RHCA standard widths are applied based on the class of stream as defined by the Ochoco National Forest. Buffer widths that apply to the planning area are:

Class I - Perennial or intermittent stream segments thereof that have one or more of the following characteristics:

1. High densities of spawning, rearing, or migrating fish.
2. Domestic/Potable water source for existing private residence or Forest Service facility.
3. Flows enough water to be a major contributor to the quality of water in a downstream reach that meets 1 or 2 above.

Class I streams have at least a 300ft buffer width on each side.

Class II - Perennial or intermittent stream segments thereof that have one or more of the following characteristics:

1. Moderate densities/numbers of spawning, rearing, or migrating fish. Based on Oregon State Forest Practices (p32,(11),(b),(B)), "Fish use will be assumed to occur upstream of the known fish use until the first natural barrier to fish use is encountered."
2. Flows enough water to be a moderate or not clearly identifiable contributor to the quantity of water to a downstream Class I reach, or be a major contributor of water to a downstream reach that meets 1 above.

Class II streams have at least a 300ft buffer width on each side.

Class III – All other perennial streams or segments thereof that do not meet higher criteria. If fish are observed in a stream mapped as Class III, it needs to be changed to a Class II. If a Class III stream needs to upgraded to a II or lowered to a IV, a fisheries biologist or hydrologist should be notified. These streams have at least a 150ft buffer width on each side.

Class IV – All other streams or segments thereof that do not meet higher criteria. These streams have at least a 50ft buffer width on each side.

Class V – Ephemeral streams - Class V is not a standard Forest Service stream classification but is being used to indicate streams that do not meet the criteria for stream Class I-IV. These streams do not have well defined channels and only flow in direct response of precipitation or snow melt. Swales are included in this classification. These streams have no set buffer width.

The following Class V Streams are of special concern and may have special stream protection requirements due to a high risk of their turning into Class IV streams and/or producing high sediment loads:

1. Those having accumulations of sediment behind woody debris, splash pools where water flows over the debris and channel sides starting to form where flow is constricted. These streams have somewhat higher litter accumulations than Class IV streams.
2. Those having steeper slopes leading to narrow channels.
3. Those having headcuts and stepped headcuts.

Perennial Streams – Normally flow year long except in periods of extreme drought. Have well defined channels and show signs of washing, scouring and/or sorting of bed material. Based on the Oregon State Forest Practices (p41,(6),(a)), "The determination that a stream is perennial shall

be … based on a reasonable expectation that the stream will have summer flow after July 15." These streams are critical in meeting state water quality temperature standards (peak temperatures normally occur in July and the first part of August) as well as effect sedimentation and turbidity. A spring that flows into a Class IV stream should be treated as a wetland with the RHCA the same as a Class IV if less than an acre or a Class III if equal or greater than an acre.

Intermittent Streams – Flows part of the year. Have well defined channels. Include channels that show signs of scouring, washing, sorting of bed material and/or evidence of riparian vegetation even though they may only flow during or immediately after precipitation or melting of snow. Intermittent streams normally lack litter in late spring and early summer, but may develop accumulations of litter or vegetation by the fall or during periods of prolonged drought. Lack of litter indicates stream flow sufficient to move material during runoff. If an intermittent stream appears to be incorrectly mapped or is not mapped at all, a fisheries biologist or hydrologist should be notified so the stream database and GIS layer can be updated. Intermittent streams don't include ephemeral streams.

Ephemeral streams – Carries only surface runoff and flows only in direct response to precipitation or snow melt. Form in slight depressions in the natural contour of the ground surface but do not normally develop sufficient flow to was or scour their channel.

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Appendix D

Range PACFISH/INFISH Monitoring

PACFISH/INFISH Monitoring

In FY 1999, the Monitoring Task Team (MTT) completed The Range Implementation Monitoring Module for the purpose of strengthening the implementation of PACFISH (Category I), INFISH (Category II) and the attendant salmon, steelhead and bull trout Biological Opinion. This module designed to provide a consistent process to collect and report results of implementation monitoring on grazing allotments and covers only implementation of livestock grazing.

In 1999, the Ochoco National developed Programmatic Biological Assessment (PBA) that would meet the monitoring requirements set forth in Biological Opinions. This PBA identifies Project Design Criteria (PDCs) that utilizes the Final Range Resource Implementation Monitoring Module; with additions/modifications to meet a Not Likely To Adversely Affect (NLAA) call for Mid Columbia River steelhead and their critical habitat. The Paulina Ranger District applies these PDCs in both Category I and Category II pastures.

Since 1999, the PDCs have been adjusted because of monitoring data and end of year reporting. The PDCs are based on Forage Utilization/Stubble Height threshold within the greenline and upper terraces at steam channels and other springs (these are identified key areas). Seasonal pasture moves are based on 2, 3, and 4-inch stubble height requirements. All pasture stubble height requirements must be 4 inches at the end of growing season. Adjustments in grazing will occur if end of growing season stubble height requirements are not met. The Paulina Ranger District encourages active involvement by the allotment permittees in the stubble height measurement process. Updated PDCs are expected to be completed in the summer of 2003 and will be implemented for the 2004 grazing season.

Objectives for PDC implementation include: maintain and improve stream bank stability in association with adequate riparian vegetation, maintain and improve existing hardwood and other riparian vegetative shade components, and minimize stream bank trampling, trailing, postholing and other undesired impacts to stream channels (Deep Creek Watershed Analysis 1999).

Deep Creek met the monitoring requirements in 1999, 2000, 2001, and 2002. Little Summit met the monitoring requirements in 1999, 2000, 2001, and 2002. There was non-use taken in Happy in 1999. The new monitoring module protocol was implemented in 2000 and Happy met monitoring requirements in 2000 and 2002. The Happy Allotment did not meet monitoring requirements on the west pasture in 2001. In 2002, the Happy Allotment had a 25 percent reduction in livestock numbers and the west pasture was rested. Derr met the monitoring requirements in 1999, 2000, 2001, and 2002.